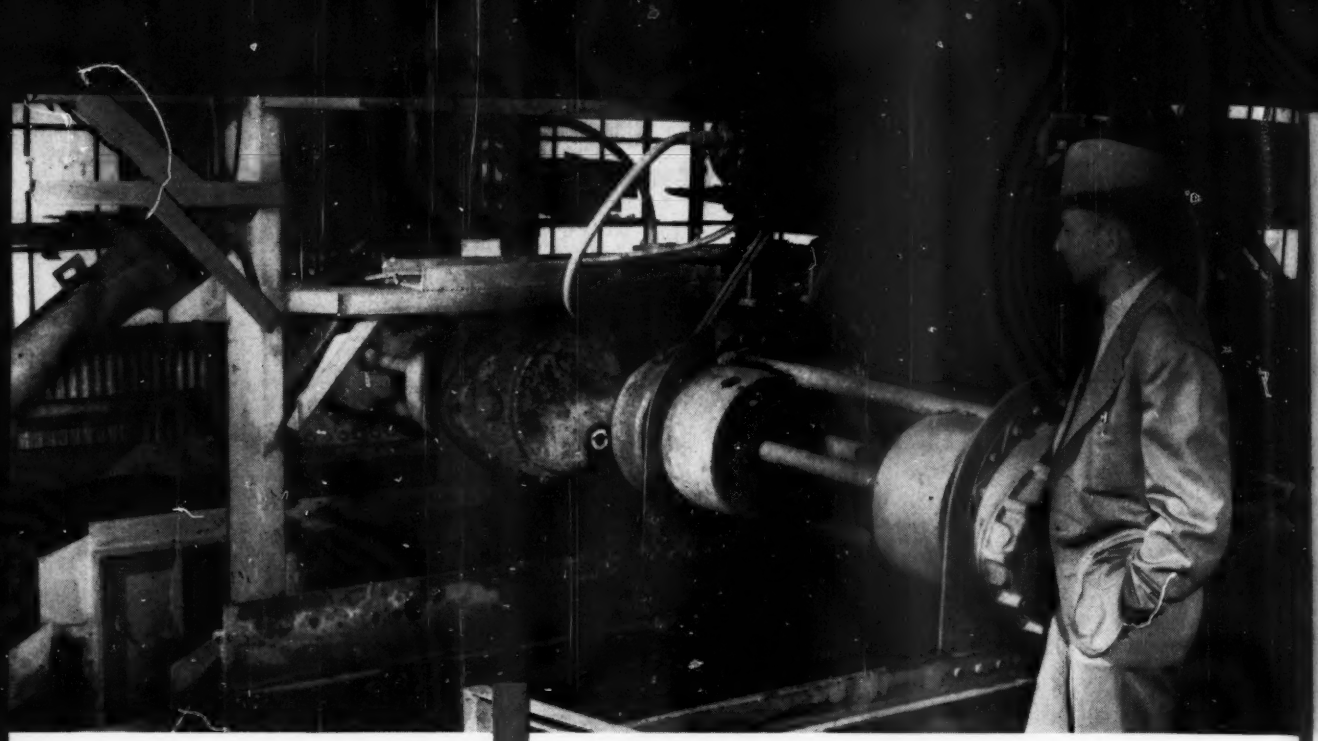
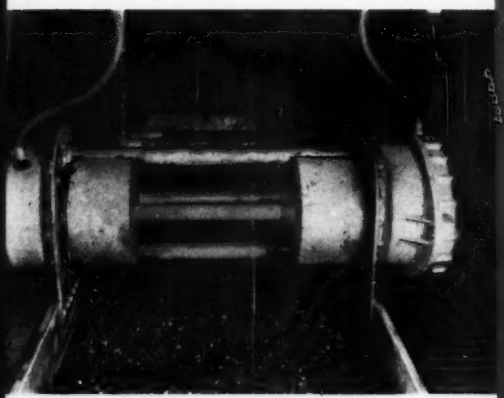
Mining CONGRESS JOURNAL

AMERICAN MINING CONGRESS

JANUARY
1955



R. E. Wright, Standard lubrication specialist, inspects dewaterizers at Midland Electric processing plant, Middle Grove, Ill. Bob, a graduate of Michigan College of Mines with a B.S. in engineering and of Standard's Sales Engineering School, has the background and experience to provide technical service on lubrication problems. His customers find this training and experience pay off *for them.*



STANDARD

helps shake lubrication problems out of dewaterizers

A big problem at Midland Electric Coal Company, Middle Grove, Illinois, was dewaterizer lubrication. For years Midland Electric shut down dewaterizers for overhaul every one to three months. This meant a two-day shutdown of the dewaterizers while carbon deposits were removed from bearings or worn bearings replaced.

In October, 1951, Midland Electric consulted a Standard Oil lubrication specialist. He studied the job, learned what was required of the lubricant. Next step was to select a Standard Oil product that would eliminate the trouble. He found one: STANOLUBE S-1 Motor Oil. Result: Dewaterizers are now overhauled *once a year.* The oil has been used in these units since February, 1952. It shakes out the lubrication problem because it (1) resists carbonization (2) withstands both high temperatures and pressures (3) its detergent-dispersant qualities hold dirt in suspension, prevent deposit formation.

This is another example of an unbeatable combination at work (1) Standard Oil lubrication specialist capable of giving technical help and (2) a top quality product that *delivers results.* Maybe you would like to put this combination to work for you. In the midwest just call your nearby Standard Oil lubrication specialist. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Ill.

STANDARD

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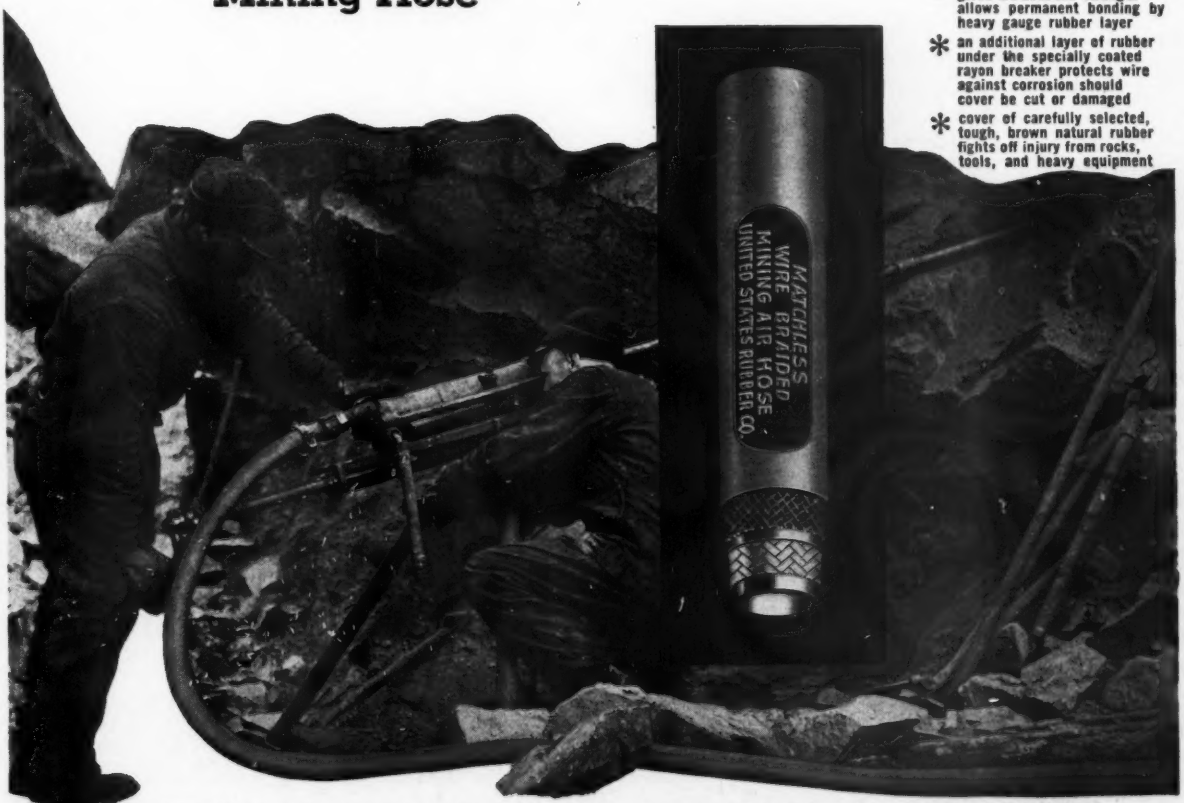
HANDLE WITH ABANDON!

No "babying" needed here! "U. S." engineers designed this premium quality hose *specifically* to meet the toughest mining conditions. And it's paid off in performance in open-pit and underground mines around the world.

A universal mining hose, U. S. Matchless® withstands the highest required working pressures for both air and water, and is recommended for high-pressure water cooling of jack hammers as well as for all heavy duty hard rock use. Highly flexible in spite of its great strength, it has demonstrated time and time again its ability to take both use and abuse indefinitely.

Mandrel-made, with a wrapped finish, U. S. Matchless is available in 50 ft. lengths from any of our 27 District Sales Offices, or by writing to the address below. *Whatever* your hose requirements, you'll find it pays to turn to "U.S." There's a job-engineered U.S. Hose for practically every purpose—a staff of "U.S." engineers to assist you in your hose selection.

U.S. Matchless Wire Braid Mining Hose



- tube of high quality neoprene is completely resistant to line oil
- special steel wire braid gives tremendous strength—allows permanent bonding by heavy gauge rubber layer
- an additional layer of rubber under the specially coated rayon breaker protects wire against corrosion should cover be cut or damaged
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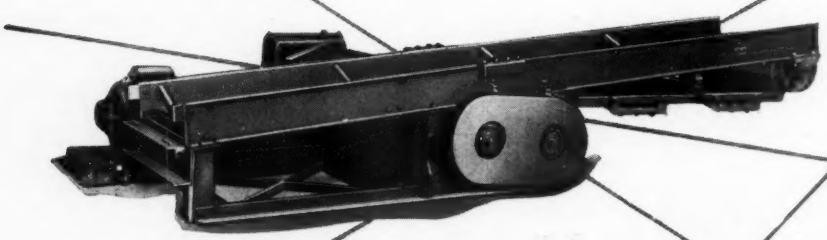
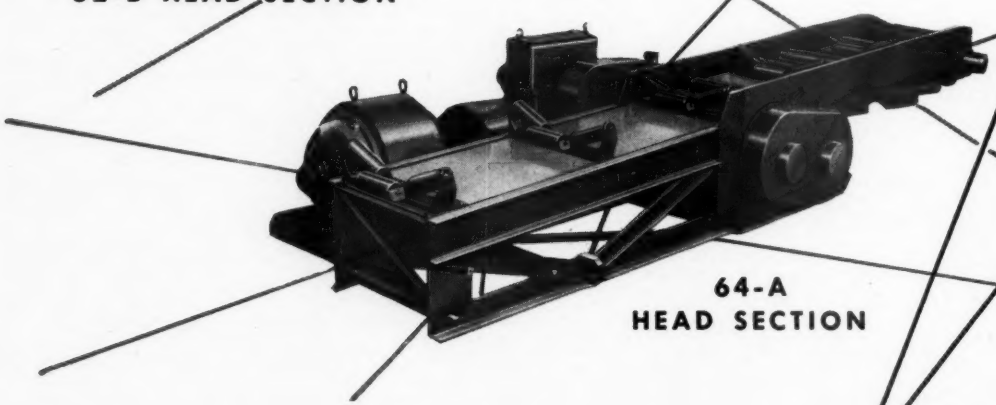
three heads...three frames...

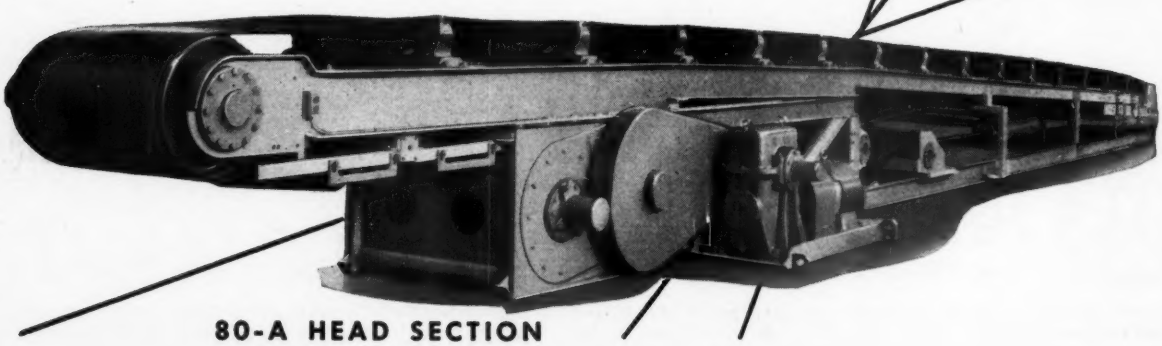
choose the exact belt conveyor for your mine from the complete JEFFREY line



52-B HEAD SECTION



64-A
HEAD SECTION



80-A HEAD SECTION

52-B FRAME

64-A FRAME

80-A FRAME

No two belt conveyor problems are quite alike—but Jeffrey units can solve all of them. With three types of sturdy head sections and three types of rugged frames—you have a selection of nine combinations to cut handling costs. Our engineers will help you select the *right* one for each gathering, slope or main line haulage job.

The three husky head sections—52-B, 64-A and 80-A—can transmit from 25 to 160 HP for belt speeds from 150 to 600 FPM. Tandem drive puts the conveyor belt in maximum contact with two gear-meshed drive pulleys for most efficient use of power on a long pull. For shorter hauls and where frequent moves are necessary, the lighter weight 52-H head unit with a single drive pulley is available.

The three frames—52-B, 64-A and 80-A—are built for belt widths from 26″ to 48″ and an idler roll size range from 2-9/16″ to 6″ dia. The wide variety of belt widths and idler roll sizes multiplies many times the nine basic types mentioned above, to give the widest possible choice of belt conveyors—of which *one* is suited to your *exact* needs.

Call on Jeffrey for underground belt conveyors. Jeffrey will specify the one correct head section for the power required and the one correct frame for the size and weight of material, the available height, frequency of changes in location, belt speed required and feeding arrangement. You are assured of high-tonnage handling at low cost, less "down time" and low maintenance. The flexibility and range of Jeffrey mine belt conveyors are unequaled—so is the quality that has made Jeffrey mine equipment famous for 77 years.

52-B Head section can be driven with a 25 to 75 HP motor and is arranged so drive can be mounted on either side. The light, portable, knockdown frames are made for 26″, 30″ and 36″ belts, and idler rolls of 2 9/16″ and 4″ can be furnished. Sections are bolted at installation for rigidity and come apart in conveniently handled components for easy transfer in low coal.

64-A For medium duty gathering or haulage, Jeffrey offers the 64-A head section and frame. At higher speeds, motors up to 125 HP can be used, and the head unit comes apart in three sections for easy moving. Frames are the knockdown pan type with dowl pin couplings, and they can be built to accommodate belt widths of 30″, 36″ and 42″, with 4″ dia. idler rolls.

80-A Head section and frame are especially designed for high speed, high tonnage and heavy duty in coal mines where the main haulage system is a semi-permanent or permanent installation. The head section is built for motor drives up to 160 HP and provides belt speeds up to 600 FPM. The frame is adaptable to 30″, 36″, 42″ and 48″ belts and 4″, 5″ or 6″ dia. idler rolls. The 80-A frame permits a choice from a variety of standard idlers, including the new Jeffrey idler with double flexible contact seals.

Planning on replacement or modernization of parts of your present belt conveyors? No matter what the make, Jeffrey can supply Head Sections, Power Units, Tail Sections, Intermediate Sections, Idlers, Impact Idlers, Loading Stations with Impact Idlers, Horizontal Pneumatic Takeups and Speed Responsive Switches. Let us quote on these units!

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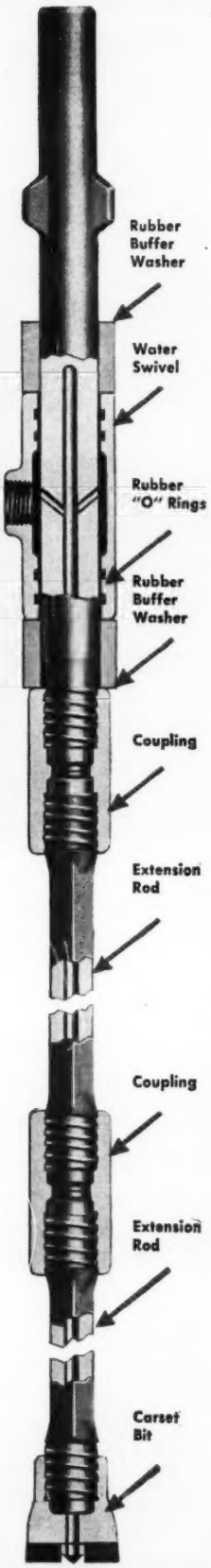
make short work of
LONG HOLE DRILLING



From bit to compressor, Ingersoll-Rand supplies everything you need for faster, more-efficient long-hole drilling

Holes up to 100 feet deep are now being drilled easily and quickly by the Ingersoll-Rand Carset method. Longer-lasting, faster-drilling Carset Jackbits when used with I-R Drifters, water swivels and coupled alloy steels, have proved both *faster* and *less costly* than diamond drilling.

The Ingersoll-Rand *complete line* of long hole equipment includes a proven water swivel that feeds air and water directly into the drill steel at high pressure without going through the drill. This plus an improved heavy-duty coupling, with the same threads as the bit, and high-strength alloy steel extension rods, gives you a remarkably successful drilling combination.

Ask your I-R representative for the whole cost-saving story. He can supply everything you need—from the bit back to the compressor.

5-88

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JANUARY, 1955

VOLUME 41 • NUMBER 1

Mining

CONGRESS JOURNAL

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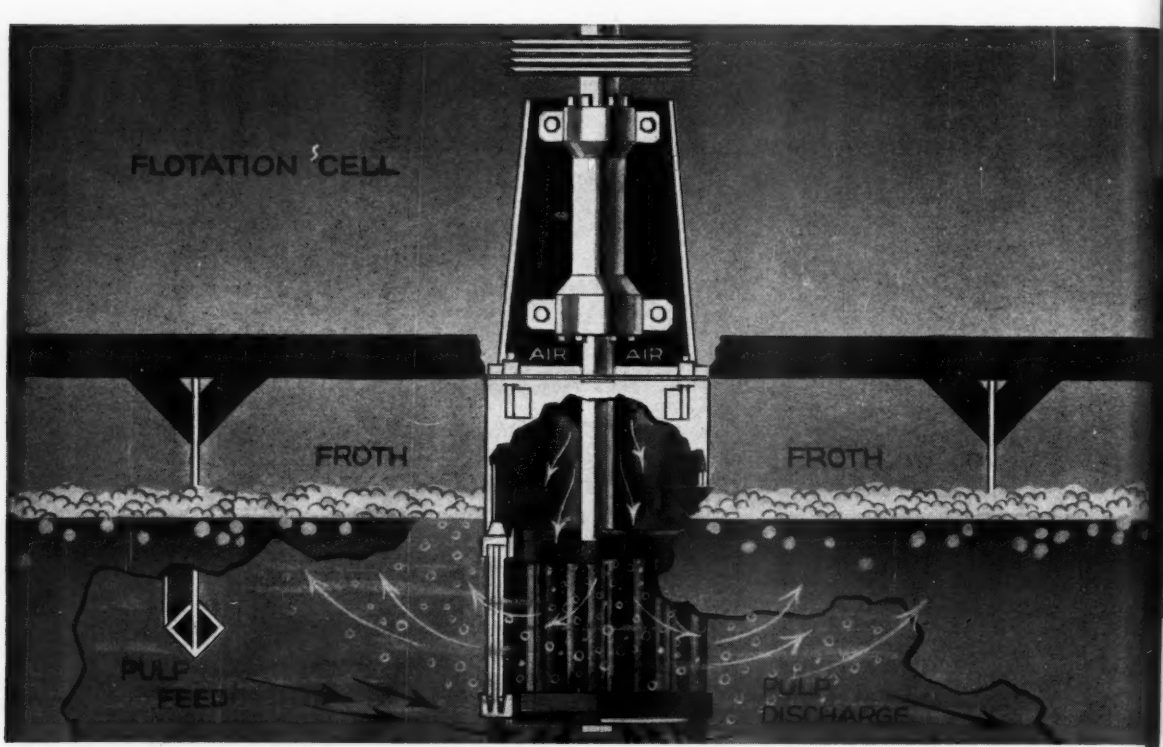
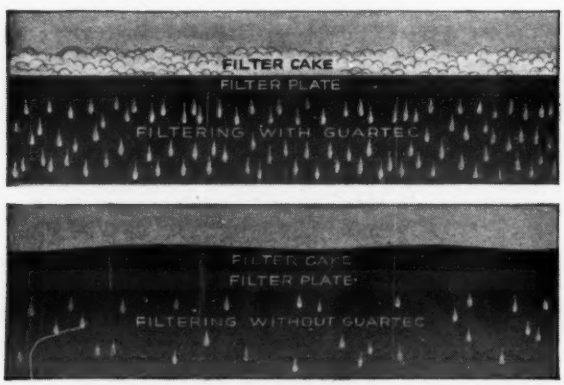
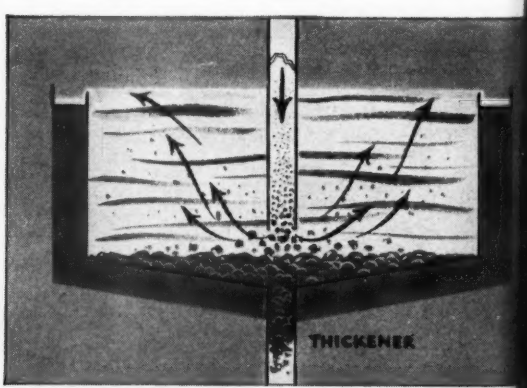
NOW...General



Blinding Gangue Materials to save on expensive collecting agents is an easy matter for Guartec. The long molecular structure of Guartec is just right to blind particles of clay. Usually just a trace of Guartec, as little as 0.15 to 0.25 pounds (4 to 8 cents) per ton of ore, effectively blinds the clay—enabling fast, efficient separation with less collecting agent. With the quick dispersion of Guartec, you can keep an effective concentration in the flotation cells at a rapid rate of pulp flow.



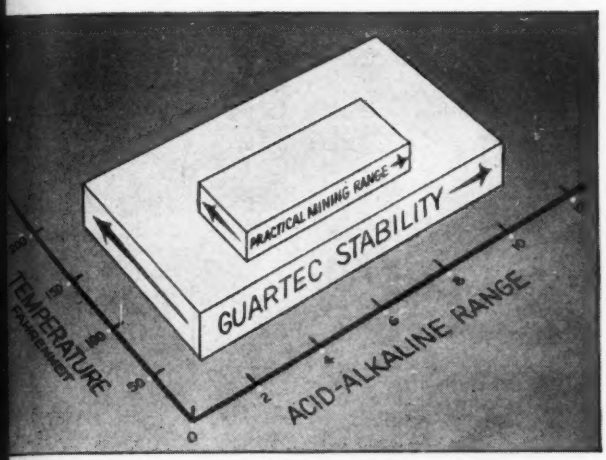
Faster, drier filter cakes are possible when you use Guartec as a flocculant for filtering ore concentrate. Guartec quickly agglomerates filter plugging fine flocs into larger masses that can be filtered quickly and easily with less "down" time and more porous filter cakes.



To speed settling in either thickener or tailings pond, as little as 0.1 pound of Guartec (roughly 3 cents) per 1,0 gallons of slime. It speeds settling many times over. Th you can increase production without added investment equipment. Guartec's flocculating speed also helps y clarify water for either re-use or disposal.

Mills Offers You a New Colloid

GUARTEC—Proved for Faster Filtering, Better Blinding; Has 5 to 8 Times the Settling Action of Starch



Guartec is stable over a wide range of practical mining temperatures and acid or alkaline solutions as shown on the chart illustrated above. Guartec operates effectively over a pH range of from approximately 1.2 to 11, and does not break down into component sugars under extreme temperature changes. It is now being used in the flocculation of pulps at temperatures as low as 40° F. and as high as 180° F.

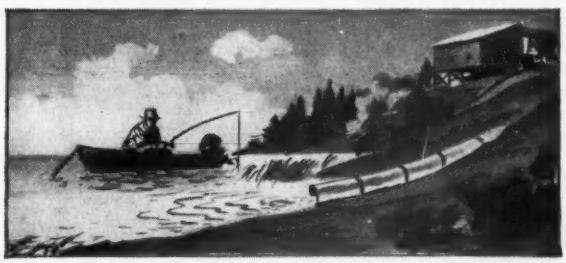
For mineral processors with filtering, settling, or flotation problems, General Mills now offers Guartec, a natural vegetable gum colloid of the guar seed.

Guartec blinds or flocculates solids. It saves expensive collecting agents, and agglomerates ore particles for fast filtering or settling. With Guartec, water can be clarified quickly for reuse or disposal.

Guartec, with 5 to 8 times the thickening power of starch, is very effective in small concentrations. It is available to you now at as low as 30¢ a pound in 100 pound, moisture-protecting bags. You can get Guartec in two grades. The regular grade is a granular type, while Guartec F is a fine-powder type.

To assure you of constant quality and uniformity, General Mills maintains a modern laboratory right at its plant—the only guar plant located in the guar-growing area of this country. So investigate Guartec in your own mining operations. Do it now.

moisture-proof lining of pliofilm protects uartec from rain, snow and other contamin-nts. This liner also helps Guartec flow smoother om the bag. As a result, Guartec is as free-owing when it goes into your equipment as hen it left the General Mills plant, with mois-re content well below the critical point.



Suspended slimes in ponds, lakes and streams can be detrimental to good will when you operate near well-traveled waterways. Just a trace of Guartec added to slimes helps settle wastes much faster, avoids pollution controversies over suspended matter.

For Sample or Technical Information, Write To:

General Mills

Special Commodities Division

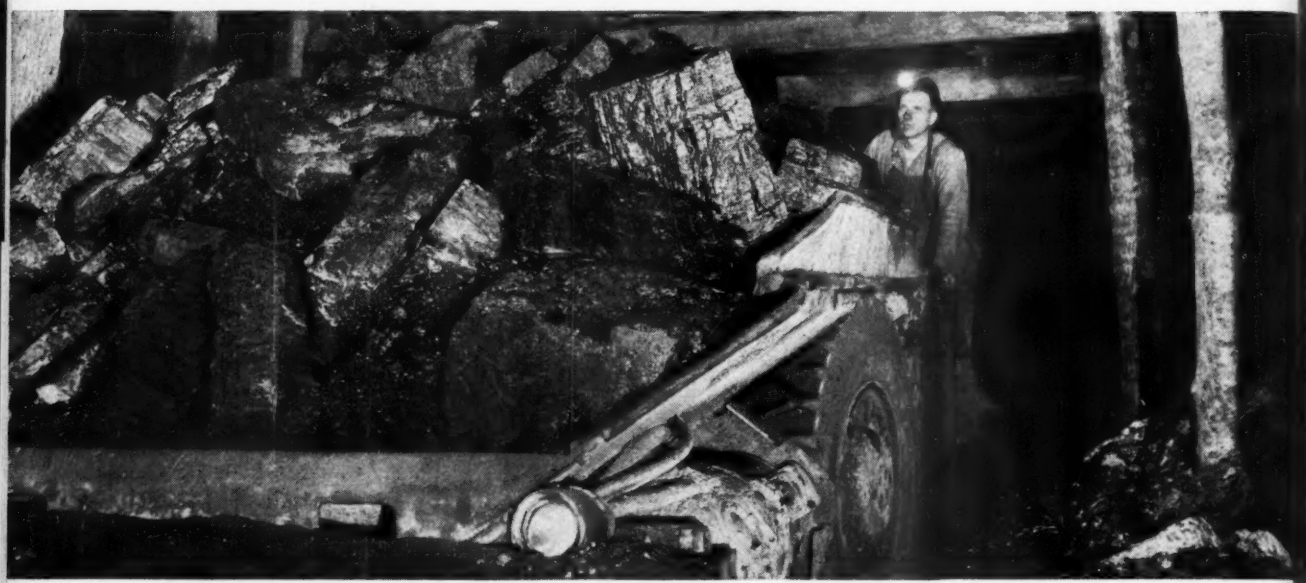
400 Second Avenue South

Minneapolis 1, Minnesota

"'Monobel' AA meets our specifications for a permissible"

States the Management of the Clinchfield Coal Co., Dante, Va.

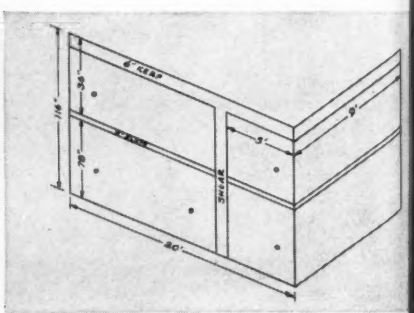
"Our No. 2 Moss Mine (Va.) has a heavy slate binder and many wet bottom holes, which can really make it tough for a permissible. To maintain production, we need one that (**1**) gives good lump, (**2**) breaks our binder into loadable sizes, (**3**) has good water resistance, (**4**) squares up the face, (**5**) shears the ribs clean and (**6**) gives us good loadability. We've found "Monobel"® AA right for the job, and have used it since the mine was opened in 1947."



HAULING off another load of firm, coarse coal . . . the type of lump desired. Loading is fast, as Du Pont's popular permissible "Monobel" AA throws the coal out where the loader can easily handle it. And the binder, running from zero to 15" thick is completely broken up, but not shattered . . . isn't mixed with the coal.

HEAVING action of "Monobel" AA consistently produces a high percentage of good lump in the No. 2 Moss Mine.

SHEARING the ribs and up the back cleanly, "Monobel" AA gives maximum recovery with no dangerous overhang.



WORKING with Du Pont technical service men, the company developed this drilling pattern for the Clintwood Seam.

A permissible doesn't gain acceptance by chance. It has to deliver, despite wet holes, tough rock formations. That Du Pont "Monobel" AA is the world's largest-selling permissible can mean only one thing: mine owners and operators throughout the industry must consider it best under a wide variety of conditions. Can it help *you* increase output, too? Test it in your mine and see. For complete details contact the Du Pont Explosives man in your district. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Del.

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CUTS OPERATING COSTS...

Users of the new N-4 brush report up to *twice the brush life* ever obtained with any previous grade. Such results occur *wherever* N-4 brushes are applied to main drive motors and generators, rotary converters and heavy-duty motors. And here's more good news – N-4 brushes cost no more than comparable grades now being used in these services!

The term "National", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

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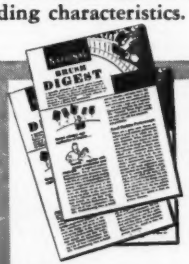

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National Carbon's instructive pamphlet series on the practical aspects of motor and generator maintenance. Supervisors should request as many copies as they need to distribute personally to their men. Coupon automatically brings back-issues and each new, bi-monthly issue for two years or more.

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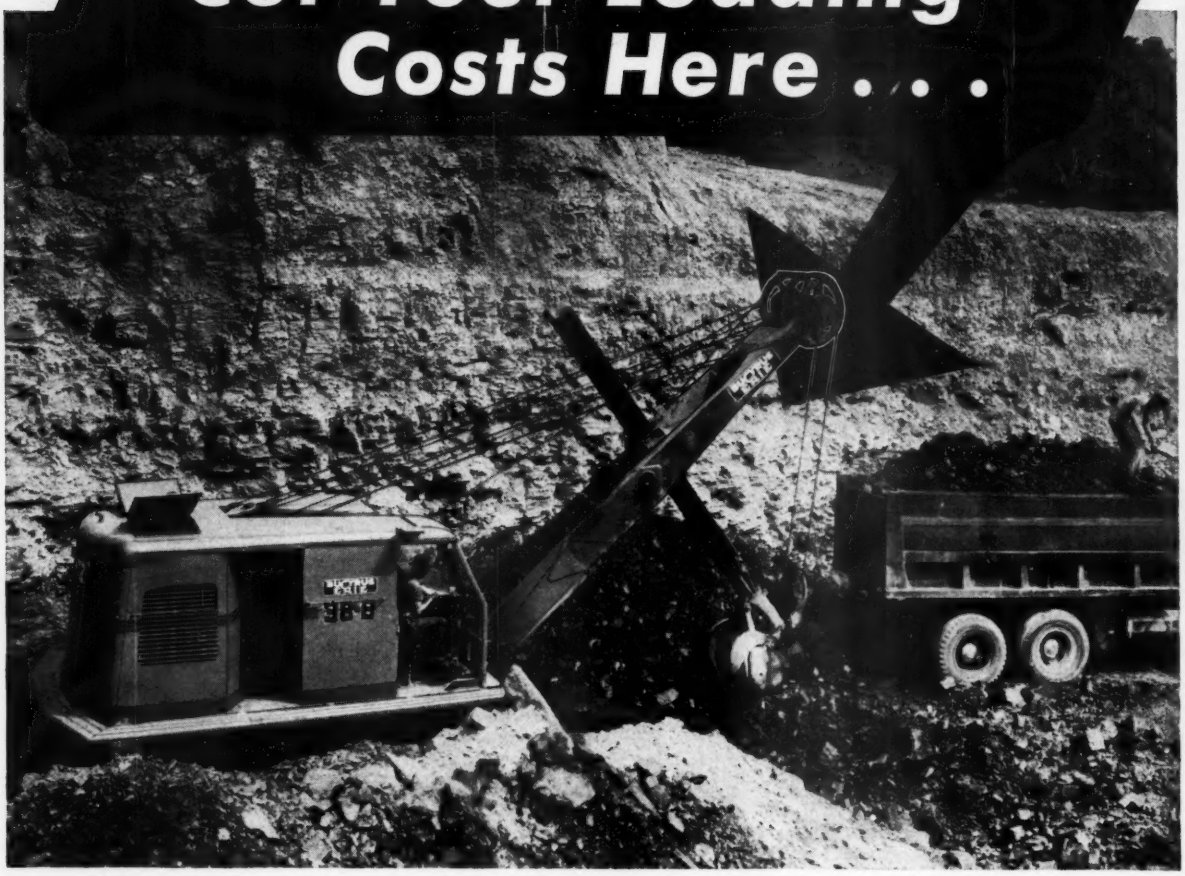

Assign your coal loading duties to Bucyrus-Erie shovels and you make a real start toward the lower costs that mean bigger profits for you. That's because Bucyrus-Eries give you these important advantages of Individual Design:

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YOU GET LONGER MACHINE LIFE because no parts are undersize or overstressed to "stretch" models. Adjustments hold longer and are easy to make. The working frame is a combination of great strength and light weight to provide a solid, rigid working foundation without excess material.

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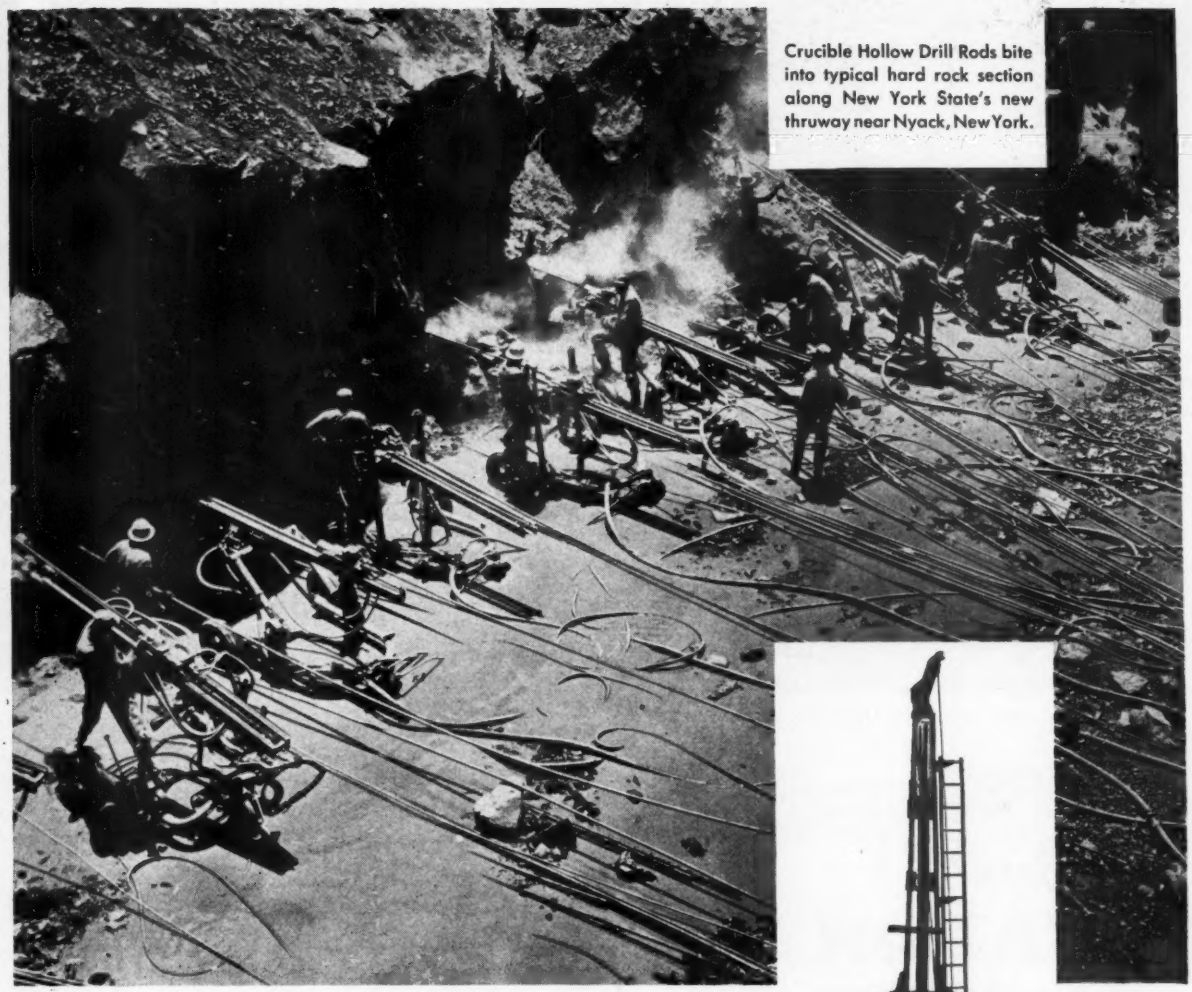
South Milwaukee, Wisconsin

Individual Design

. . . for every model in the line means that each is designed from the ground up to handle its rated load most efficiently. There is no over-dippering or over-powering simply to create another "new" model. All factors affecting efficiency such as speed, power and weight are properly balanced for most efficient overall performance.



Crucible Hollow Drill Rods bite into typical hard rock section along New York State's new thruway near Nyack, New York.

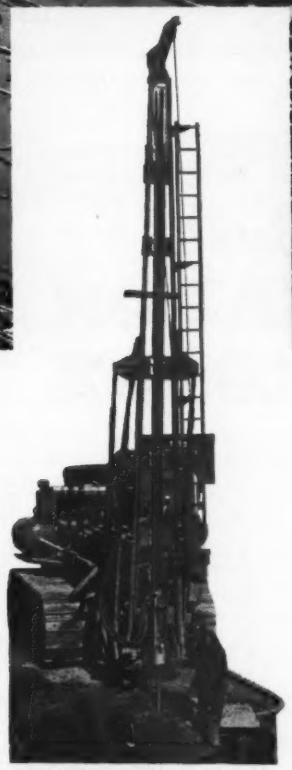
CRUCIBLE HOLLOW DRILL RODS

on the firing line —New York State Thruway

Chewing through hard rock sections of the New York Thruway, Crucible Hollow Drill Rods are helping to build this modern, high-speed highway across the state.

To make this motorist's dream come true meant careful planning by highway engineers—cooperation of dozens of contractors—top quality equipment. That's why large quantities of Crucible Hollow Drill Rods are being used. For experienced construction men *know* they can always depend upon Crucible Hollow Drill Rods for uniformly high performance in the field.

Crucible makes its hollow drill rods to *tool steel standards.* And that means *extra* quality . . . fewer broken rods and lost bits . . . *lowest cost per foot of hole drilled.* Make all *your* drilling jobs go smoothly—specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*



Joy Challenger drill and Crucible Hollow Drill Rod at work on New York State Thruway, Arden, N.Y.

CRUCIBLE first name in special purpose steels

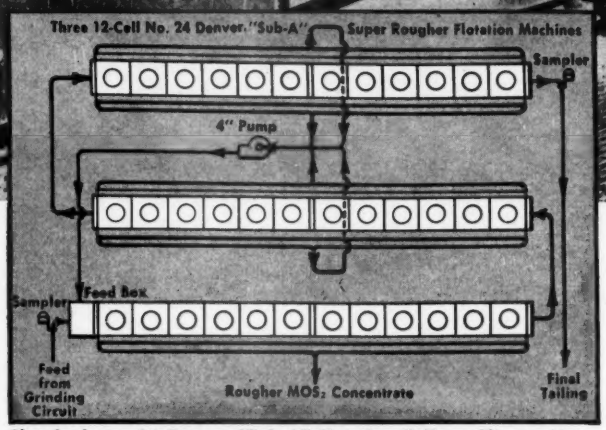
Crucible Steel Company of America

enver "Sub-A" Flotation Machines are used at Climax to recover "moly."

DENVER "SUB-A" FLOTATION at CLIMAX

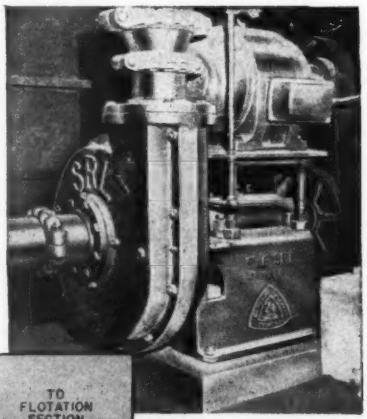
Denver Equipment Company is proud of the part that Denver "Sub-A" Super-Rougher Flotation Machines are playing in the success of Climax Molybdenum Company and other mining companies throughout the world. Denver "Sub-A" Machines are the world's leader and serve in every important area of the world.

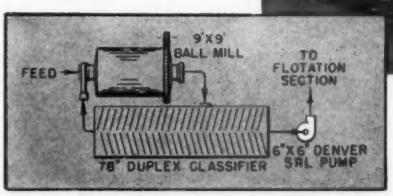
DECO manufactures a complete line of milling equipment in addition to maintaining one of the world's most complete ore testing laboratories. Information on any mineral recovery problem or machine will be supplied on request.



Sketch shows 36 Denver "Sub-A" Flotation Cells at Climax. Note how flotation feed enters at lower left and flows through all 36 cells. Concentrates from banks No. 2 and No. 3 are returned to bank No. 1 (photo above). Final rougher concentrate is removed from bank No. 1.

Overflow from classifier is pumped to the flotation section through a Denver SRL Pump. These pumps are rubber lined to resist abrasion. Pumping efficiency is high and power requirements are low.





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BEFORE — A loading machine dismantled for inspection and repair. AFTER — The small photo shows the completely rebuilt machine ready for return to customer.

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- **parts replaced or rebuilt as necessary**
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two conveniently located plants—Bluefield, West Va. and Harlan, Ky.—both completely equipped for all electrical and mechanical repairs and rebuilding

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For the lowest installed resistance in arc-welded rail bonds, see your O-B representative about the AW-22 Bond. Its angular shaped terminal, shown at right, offers you the fastest, easiest welding possible.

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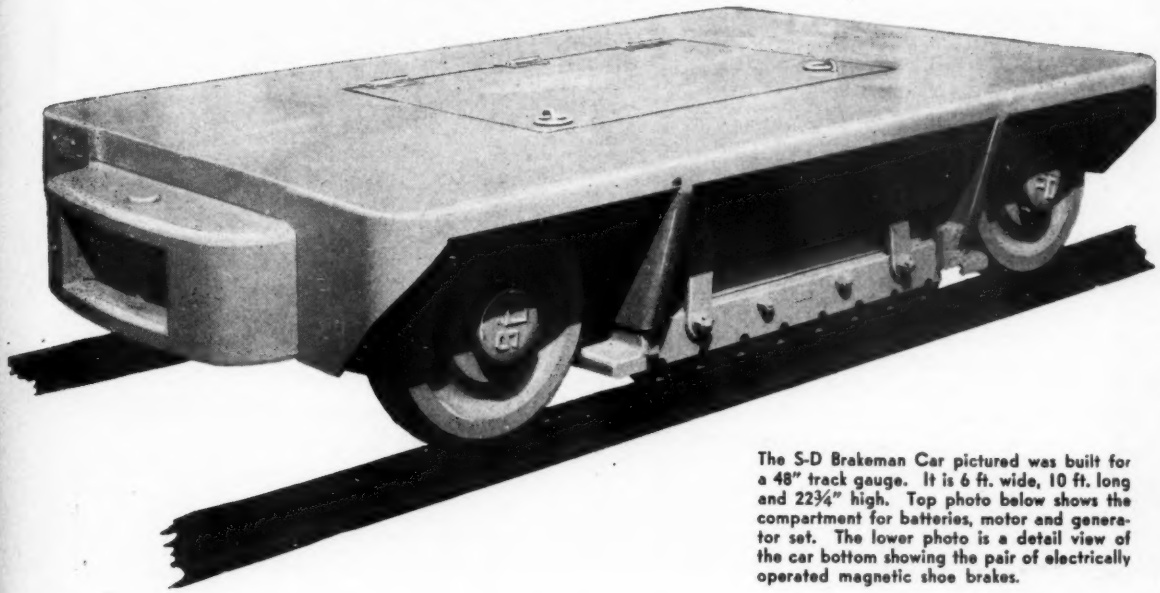
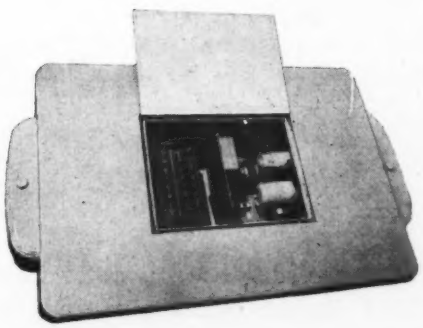
SANFORD-DAY ANNOUNCES THE S-D BRAKEMAN CAR

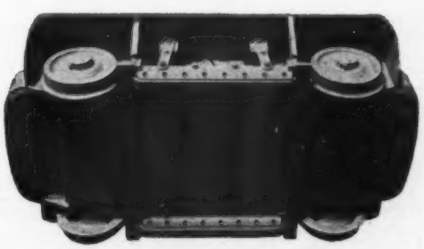
Now you can eliminate skids and additional locomotives for braking trips downgrade!



The S-D Brakeman Car pictured was built for a 48" track gauge. It is 6 ft. wide, 10 ft. long and 22¾" high. Top photo below shows the compartment for batteries, motor and generator set. The lower photo is a detail view of the car bottom showing the pair of electrically operated magnetic shoe brakes.

YOU NEED NO LONGER resort to skids or costly locomotives for extra braking power. We have developed a special car for braking that incorporates electrically operated magnetic shoe brakes. The S-D Brakeman Car pictured here was built for a mining company to replace a locomotive used in trips for braking. The "Brakeman Car" is built to meet your particular requirements. It may be used between locomotives . . . between locomotive and cars . . . between cars or at end of a trip. Controls for the shoe brakes can be provided at the locomotive operator's fingertips, regardless where the Brakemen car is located in the train. Ask us to supply you with complete information. *Sanford-Day Iron Works, P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tenn.*





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GM DIESEL
CASE HISTORY NO. 537-42

USER: C. H. Snyder
Coal Company,
Cowansville, Pa.

INSTALLATION: GM "6-71"
2-cycle Diesel replaced
4-cycle Diesel in shovel
over 2 years ago.

PERFORMANCE: Owner
C. H. Snyder reports
better performance,
25% more production
with GM Diesel power.
GM Diesel starts faster,
uses less lube oil, gives
smoother operation.

It Pays to Standardize on
. . . available in more than 750 models of equipment built by over 150 manufacturers

GM
GENERAL MOTORS
DIESEL
POWER

Production up 25% with

GM DIESEL POWER

When his shovel was two years old, owner C. H. Snyder switched to General Motors Diesel power and upped production from 8,000 to 10,000 tons of coal per month. He converted to GM Diesel because these 2-cycle Diesel engines have given him dependable low-cost performance in a tractor, dragline, truck and another shovel.

Fast-accelerating, smooth-running GM Diesels do more work at less cost in new equipment or old. They start at the push of a button even in coldest weather—deliver power at every piston downstroke to speed operations, boost production. Low-cost parts are readily available and GM Diesel distributors back up GM Diesel performance with on-the-spot service. Call your distributor today—ask him about low-cost horsepower for *your* job.

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GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines, 30 to 300 H.P. Multiple Units, Up to 893 H.P.

Editorials

JOHN C. FOX, *Editor*

JANUARY, 1955

The Right To Work

SECRETARY of Labor James Mitchell stirred up a hornets' nest when he said that State right to work laws "do more harm than good" and that he was "categorically" opposed to them. In making these statements, in an address before the annual convention of the Congress of Industrial Organizations, he was directly contradicating President Eisenhower's oft repeated assurances that he would "see that the legislative rights of the States and local communities are respected" and "we will not reach into the States and take away from them their powers and responsibilities to serve their citizens."

It was heartening to learn that President Eisenhower quickly let it be known that Secretary Mitchell was speaking for himself and not for the White House. But it is alarming to have a member of the Cabinet advocating even more control of labor relations on the national level. This is what abrogation of State right to work laws would mean.

Seventeen States now have laws protecting their citizens against insertion of union shop provisions in collective bargaining contracts, provisions which compel an employer to dismiss an employe who does not belong to the particular union involved. These laws reaffirm the principle that a man has the right to join any union he pleases—or none at all, if he so chooses. The Taft-Hartley Act, passed by a more than two-thirds majority of both houses of Congress, specifically grants to the States the right to enact such laws. It was believed that such a provision would help restore to the individual his right to decide for himself whether or not he wanted to join a union.

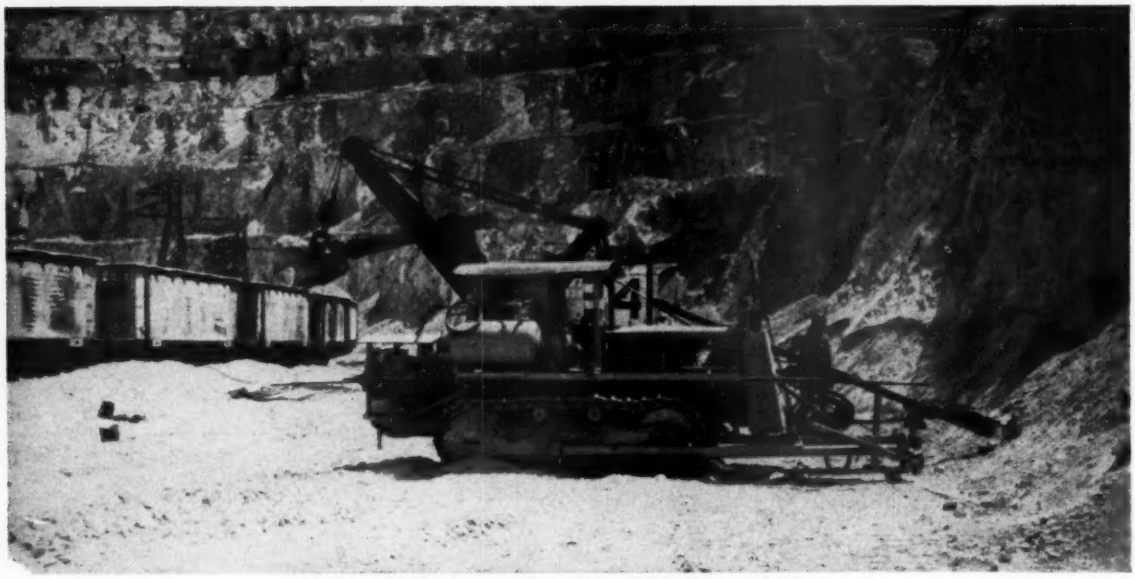
President Franklin D. Roosevelt, not noted for "union busting," had this to say in 1941, when commenting on the refusal of the National Defense Mediation Board to grant a closed shop in the "captive mines" case.

"I tell you frankly that the Government of the United States will not order, nor will Congress pass legislation ordering a so-called closed shop.

"It is true that by agreement between employers and employes in many plants of various industries the closed shop is now in operation. This is a result of legal collective bargaining and not of Government compulsion on employers or employes. It is also true that 95 per cent or more of the employes in the particular mines belong to the United Mine Workers Union.

"The Government will never compel the 5 per cent to join a union by Government decree. That would be too much like the Hitler methods toward labor."

Surely no right thinking American worker, nor his representatives in the Congress of the United States, seriously considers State right to work laws detrimental to fair and honest collective bargaining, or a threat to sound industrial relations and economic progress.



Drilling and blasting are integrated with loading and haulage

Mobile Drill Improvements at Utah Copper Pit

Revolutionary Changes in Drilling and Blasting Save Money, Increase Output with Greater Safety

By L. E. SNOW
General Foreman
Drilling and Blasting
Kennecott Copper Corp.

THE mobile drill has been responsible for revolutionary changes at the Utah Copper operations of the Kennecott Copper Corp., viz.:

(1) Reduced the man count of the Drilling & Blasting Department by 34 percent.
(2) Retired sixty (60) miles of compressed air line.
(3) Eliminated annual cost of $105,000 for operating a central compressed air plant.
(4) Retired ninety-four conventional drills and accessories.
(5) Eliminated maintenance costs on retired equipment.

The first Mobile Drill was developed, tested and placed in operation at the Utah Copper pit in the summer of 1951. Since then, eight additional Mobile Drills have been put into service and the conversion to all mobile drilling was accomplished in November 1953.

In order to appraise what mobile drilling has accomplished, an understanding of the operation of the entire mine is helpful.

The year 1954 marked the 50th anniversary of the starting of the Utah operations. Today there are 44 electric shovels in operation. These load into standard gauge railroad cars on as many levels and connecting switchbacks in the process of deepening and widening the giant amphitheater that was once a good sized mountain between two canyons. From the highest level on the West Side Section of the mine at an elevation above sea level of 7800 ft to the present bottom level at 5790 ft is a vertical distance of 2010 ft. Nearly every year a new level is developed extending this measurement by 50 ft and making it mandatory to push back the encircling levels and switchbacks to maintain safe working slopes. The top 21 levels average 70 ft in height while the lower sub pit levels are maintained at 50 ft.

Shovel Operations

Shovel operations, governed by the daily requirements of ore tonnage and ore grade, and by bench room, necessitate frequent shovel moves which in turn require that daily drilling be planned strategically. All other departments, such as the Drilling and Blasting, Track, Electric and Maintenance Departments are subservient to the needs of the Train and Shovel Department to achieve the main purpose—that of keeping the shovels in operation. This requires much planning and close cooperation between the departments involved. Some 83,000 tons of ore and 138,000 tons of waste, or a combined total of nearly 250,000 tons of material, must be blasted daily to keep these shovels in operation.

The lower section of the mine is composed mainly of porphyry in which the disseminated ore values occur. Certain sections of the porphyry are highly silicified and difficult to drill. The upper sections of

the mine consist mainly of overlying quartzite beds varying from soft to highly silicified rock that is also difficult drilling. A minor portion consists of old recemented fills which must be drilled through casing and blasted to prevent shovel burials.

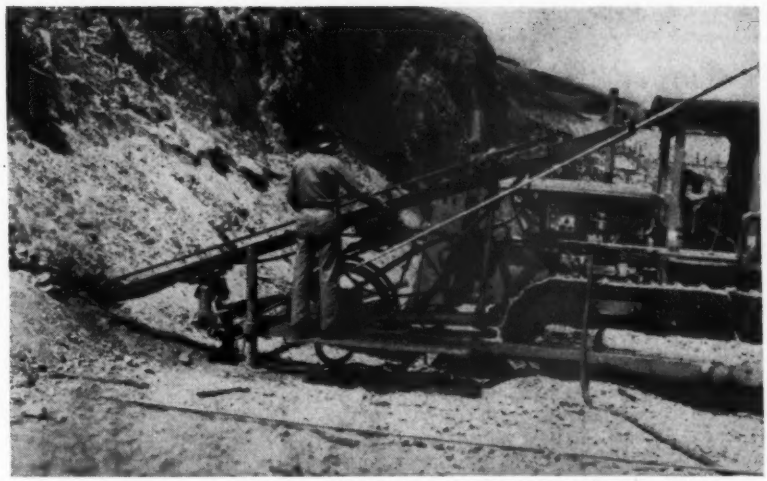
Drill Hole Patterns

As the shovel advances along the level digging to a solid bank, the men of the Drilling and Blasting Department trim the banks preparatory to drilling toe holes 24 to 28 ft deep. These holes are drilled from prepared drill grades and are so inclined that the bottom of the hole is approximately five ft below bench grade. Horizontal spacing of these holes averages 22 ft; exceptions being made where faults occur in the bank.

Blasting of these toe holes leaves broken material for the shovel on its "clean-up" cut. Upon turning the shovel and picking up the "clean-up" material the track is moved some 26 to 30 ft and the shovel is then ready to repeat the process. Toe hole drilling accounts for two-thirds of all drilling.

In the higher bank sections of the mine, and wherever necessary, single rows of down holes are drilled up to 28 ft in depth and spaced, on the average, 23 ft apart. This type of drilling amounts to approximately one-third of all drilling. Usually, these holes are shot into the shovel pit following the toe hole clean-up so that it is necessary for the shovel to turn and take an additional clean-up cut before the track is ready for shifting and the entire cycle repeated.

The Utah mine has a few extremely high banks (approximately 100 ft in height) for which a series of holes must be drilled midway up the bank to maintain a safe slope. These are no more than normal toe holes except that holes are collared midway up the bank while working on top of broken material resulting from one of the earlier blasts. This type of drilling amounts to less than one percent of the total.



Toe holes are inclined to bring bottom of hole five ft below grade

The average daily total of all types of holes drilled amounts to 2680 ft, or 74.5 ft per shovel operating shift. This means blasting an average of 91 holes per day.

Approximately 82 percent of all dynamite used is semi-gelatin, *Gelamite* #1, having a 65 percent weight strength. This powder has good water repellant qualities, especially, when left within the 1¼ by 8 in. waxed paper cartridge.

The Gelamite is used in all springing and loading of toe and bank holes. A minor amount is used for secondary blasting, trimming banks, springing down holes, occasional loading of extremely wet down holes, and for all primers.

Bag powder, 65 percent strength, is used in loading almost all down holes. It is a free-flowing powder, packed in boxes containing four 12½-lb bags. It lacks the water resistant qualities of the Gelamites. It is possible to get more powder into the blasting chamber of the hole by pouring the contents of the bag into the hole. A primer cartridge of one stick of Gelamite powder is used to explode the charge.

Powder consumption (including powder used for chambering, trimming of banks and blasting) amounts to approximately 7,000,000 lbs per year which gave a powder factor of 11.436 tons per lb for 1953.

Springing and Loading of Holes

The powder charge is placed in a chamber at the bottom of all holes drilled—none in the drill hole proper. This chamber is made by setting off a series of small charges in the bottom of the hole until a chamber is developed large enough to accommodate the desired powder load. This load will vary from 50 to 300 lb of powder depending on ground conditions and burden of ground on the hole.

Three men comprise the normal crew for the springing and loading of the toe holes.

As a safeguard during springing, a warning signal is sounded and red flags are placed on the edge of the bank indicating to men working on lower levels where the springing operations are taking place.

Holes may be left for a day or two until there is a sufficient number of holes to make the desired blast. Wet holes are loaded just prior to the blast.

Detonating the Hole

The majority of chambered drill holes are detonated in groups by the use of Primacord. A powder cartridge, taped to the Primacord, is in-

All blastholes are sprung

serted into the hole, usually through a loading pipe, and sufficient powder then put in to insure a firm contact of the Primacord with the main powder charge. Sufficient Primacord is left outside of the hole so that the ends of the cord can be properly fastened to the main Primacord blasting line just prior to the blast. In this type of blasting a fuse and blasting cap is taped to the end of the Primacord trunk firing line with the "business end" of the blasting cap being towards the loaded holes. The Primacord, having a detonating speed of over 20,000 fps, explodes all holes in the series practically instantaneously. This results in better breakage of the bank when compared to single hole blasting. The introduction of Primacord has a distinct safety feature in that it has eliminated the necessity of there being any blasting caps in the holes.

Blasting is done following completion of the day shift operations. At the specified time, and after all safety warning signals have been sounded, the blasting starts in the lower levels of the pit and progresses towards the top levels of the mine.

Mobile Drill Design

Expanding operations of the pit accentuated problems for the Drilling and Blasting Department such as:

(1) The need for increased air pressures at the drill which had averaged 50 to 60 psi.

(2) A central compressed air plant that was taxed to capacity.

(3) Moving drills and equipment via rail with a minimum of delay to train and shovel operation.

The mobile drill unit has proven to be a satisfactory answer to these problems and also has shown many more advantages.

While the original mobile drill performed satisfactorily, many improvements have been incorporated into the present design. The mobile drill combines standard units of crawler tractor, compressor, drill and mount, water, air tanks and supply racks into a completely integrated unit.

The prime power unit is a D-7 Caterpillar tractor with a four-cycle, water-cooled, diesel engine that develops 93 belt horsepower. Speed, governed at full load, is 1000 rpm and drops to 750 rpm at maximum draw bar pull. This engine furnished power for the moving of unit over the same terrain and ramps used by other mine tractors. It also provides power through the front end power take-off for hoisting and lowering of drill assembly through a dual cable and pulley arrangement in much the same manner that an angledozer blade is raised and lowered. A metal shield protects the radiator from mud blown out of the drill hole.

A cab supported on cables, to reduce effects of vibration, has been erected over the tractor to protect equipment and operators in inclement weather. The rear power take-off is used to drive the compressor.

A Worthington M-80, two-stage, air-cooled, portable compressor is driven directly by the tractor engine through a flexible chain coupling. This compressor is mounted at the rear of the tractor to which a heavy rail bumper and screen is attached for rear end protection of the compressor intercooler. Gauges showing receiver air pressure, intercooler air pressure and compressor oil pressure are close connected to the compressor. Controls regulating the compressor and synchronizing tractor speed to compressor demands are incorporated in the unit.

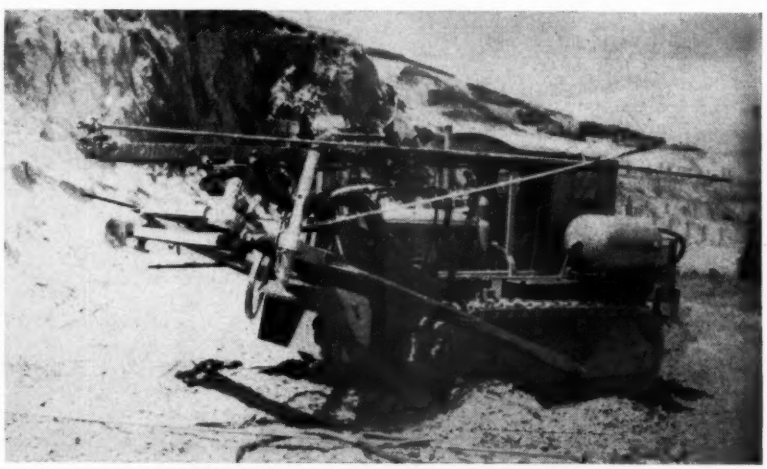
Rating of the M-80 compressor (with new type rectangular valve assembly) at 6000-ft elevation and 1000 rpm is 414 cfm. This is plenty to operate the drill and feed motor at the 90 to 100 psi range maintained while drilling. The hot discharge air is piped through the water pressure tank placed on the left hand side of the tractor cab. This U-tube acts as an after-cooler and also prevents drilling water from freezing in subzero weather. An air whistle for signalling is placed on the air receiver. Water is pumped into the 80-gal pressure tank by means of an air-injector pump.

A drill frame of five-in. steel tubing is attached to the trunions of the tractor. A four-in. swing arm fastened to a cross member of the drill frame supports the drill carriage allowing it to be swung across the front of the drill frame through a double bar arrangement for use in drilling at right angles to the tractor. The entire drill frame is raised or lowered through use of double cable and pulley combination attached to the front end power take-off of the tractor. Two adjustable support legs fastened to the sides of the drill frame help to give stability to the machine while drilling. Spare drill rods, blow-pipe and other tools are carried on a side rack extending under the water tank.

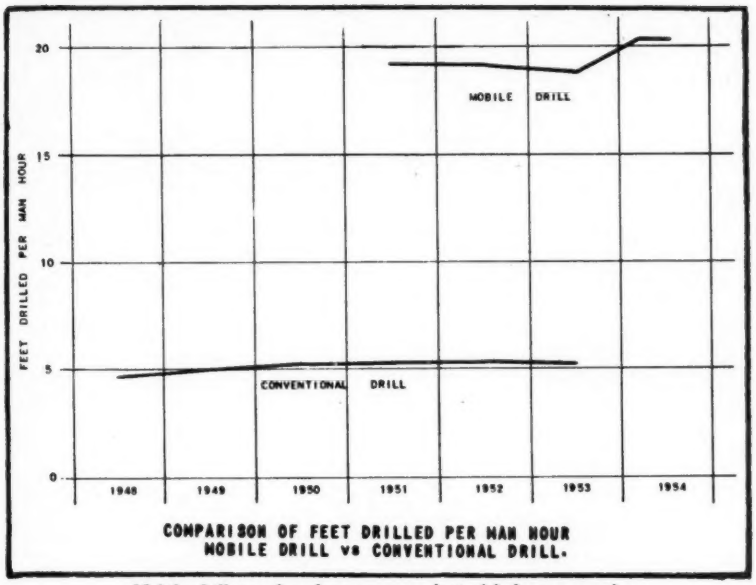
A Worthington WD-40 four-in. drifter drill is attached to the carriage by means of a conventional slab-back. This drill is equipped with a chuck for 1¼-in. round, lugged ("CA"—alloy) drill steel that is threaded for use of I-R, type 2, detachable steel bit. Three-in. starter bits are used with a gauge reduction of ⅛ in. per drill rod which results in a minimum hole diameter of 2½ in. The rotation of drill steel is 40:1 a faster rotation (30:1) is currently being tested in these drills. A double water and air tube arrangement allows for the constant blowing of air while drilling; thereby removing cuttings from the face of bit and furnishing air for cleaning of the drilled hole. For toe hole work a steel support rack is bolted to the drill for protection while the steel is being withdrawn from the drill hole. In down hole work this is quickly replaced with a safety ring.

Work of the Drilling & Blasting department is confined to day shift only (8 a.m. to 4:30 p.m.). Two men, consisting of a machineman and helper, constitute the drilling crew. Little time is lost in traveling to the working place and moves from hole to hole consume but a matter of seconds, the operator driving the tractor into the new set-up position, guided by the helper. In toe and bank hole drilling the normal practice is to use 8, 16 and 24-ft lengths of drill rods, however, in softer ground a 12-24-ft drill rod combination may be used. Drilled holes are blown out by the helper while the machineman is drilling a subsequent hole; the resulting drop in air pressure, being of short duration, has little or no effect on the drilling.

In most cases drill crews are ro-



Mobile drill can move from hole to hole quickly



Mobile drills produced many more feet of hole per man-hr

tated after two weeks of drilling, the men going to other required jobs such as springing and loading of holes. This makes for a competitive situation between crews and permits the training of all men of the department in the operation of the drill.

Daily records are kept showing the location of holes, drill footage, fuel oil consumed, drill steel breakage and other pertinent data.

Safety Improved

The Mobile Drill has satisfied one of the prime objectives sought in our planning a safer method of drilling.

(1) The mobile drill crew has been moved away from the dangerous zone existing close to the bottom of the banks. The four to one increase in drilling speeds has meant a corresponding reduction in the total man hrs of exposure.

(2) Mobile drill grades have left the springing and loading crews with a safer loading platform. There is no longer need to carry powder up paths over broken material to service the loading crews.

(3) Better housekeeping has eliminated many of the stumbling hazards that prevailed with the old style drills.

(4) Lifting of drill equipment largely by mechanized means has practically eliminated hernia possibilities.

Minor repairs are made by the operators of the drill. Other repairs and oil changes are made by the shop angledozer repair crew which travels to the machine on a railroad speeder car. Whenever major repairs are needed, the mobile units are run onto a flat car and transported to the main shop.

Operating Improvements

Due to the heavier four-in drills, more stable set-ups, and better air pressures, a faster penetration of the rock is realized over the former drill performance.

There has been an increase from five to 20 ft per man hr of drilling. This improvement in the drilling process has permitted a 34 percent reduction in department personnel despite increased daily production.

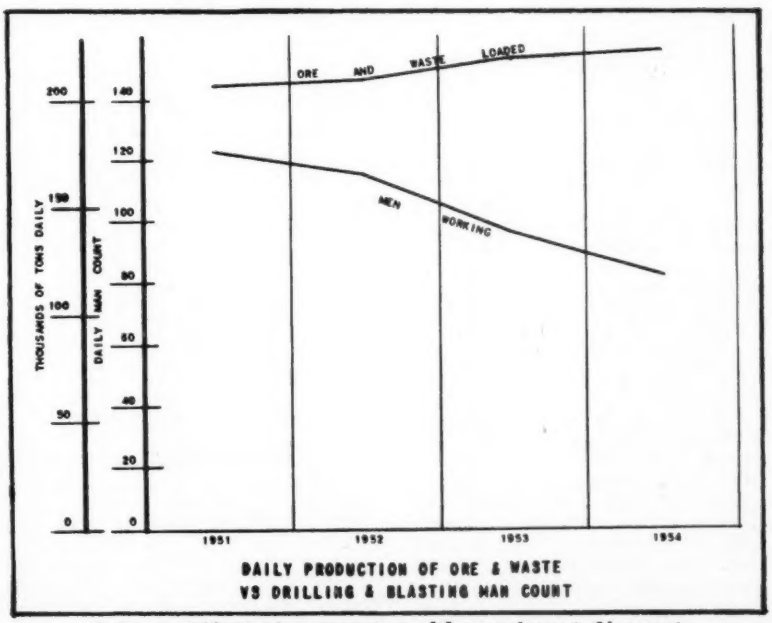
Reduction in department personnel has been accomplished through the labor turnover and not by layoffs. Surplus labor has been used in the work of salvaging the air line and other equipment. This has resulted in labor's acceptance of the mobile drill.

In addition to eliminating 60 miles of air transmission line, a central compressed air plant and 94 conventional drills and accessories, the mobile drill has resulted in the following improvements to the operation, viz:

(1) Increased shovel flexibility and efficiency by:
   (a) Decreasing delays of trains and shovels due to the past practice of moving drilling equipment over mine trackage.
   (b) Less "down time" of shovels waiting for ground to be drilled and blasted.
   (c) Greater efficiency and improved method of drop cutting to a lower level.
   (d) Increased shovel tonnage through better breakage of banks as a result of more uniform lateral spacing of drill holes and uniform position of the powder charge with relation to the level grade.
   (e) More level room due to the elimination of air lines; and provision of roadways for dozer travel so that travel over and damage to the trackage has been reduced.

(2) Increased efficiency of the Drilling and Blasting Department through:
   (a) Improved general housekeeping through reduction of the supply dumps which

(Continued on page 66)



Drilling and blasting improvements cut labor requirements 34 percent

The Dehue, W. Va., preparation plant of the Youngstown Mines Corp.

Operating Record of A West Virginia Dense Medium Cleaning Plant - Part II

After Five Years Operation, Plant Feed is Up 11 Percent and Magnetite Consumption is Down More Than 50 Percent

By DONALD H. DOWLIN and EDWARD JOLLY

Chief Engineer and Preparation Engineer, Respectively
Youngstown Mines Corp.

and

DAVID R. MITCHELL

Head, Dept. of Mineral Engineering
The Pennsylvania State University

IN September 1949 the Youngstown Mines Corp., a wholly owned subsidiary of the Youngstown Sheet and Tube Co., put into operation a dense medium coal preparation plant at its Dehue mine in Logan County, W. Va. A change to full seam mining and mechanical loading from hand loading at that time made the construction of the cleaning plant necessary. Extraneous ash is the principal impurity removed in the preparation plant and the product is used solely for by-product coking. The seam mined is the No. 2 Gas, locally called Eagle.

In the December issue of Mining Congress Journal, a description of the plant flow sheet, the coal washing section, coal handling, and refuse handling were described in detail. Following is a description of the dense medium circuit, rinse water circuits and operating results of the plant.

Refuse Handling

Reject material from the washer is sluiced onto a 3 by 10-ft horizontal single-deck vibrating screen. The screen has an amplitude of 0.40-in. and a 940 rpm speed. It is suspension cable mounted and driven by a five-hp, 1750-rpm motor through a v-belt drive. The screen is equipped with sizing cloth with 0.047 by ½-in. openings, 0.080 in. diameter stainless steel wire with the long dimension parallel to the length of the screen. The cloth is protected. The first section of protective cloth at the feed end consists of ¾ by 9-in. opening and ¼-in. diameter spring steel wire. The remaining two sections are 1 by 9-in. openings and ¼ in. diameter spring steel wire. In all three sections the long dimension of the opening is parallel to the length of the screen. The protecting screen and sizing cloth, as designed, have proven satisfactory. However, a unit of larger size would be more suitable. At times the screen is over-loaded, and poor draining and rinsing of the refuse results.

In an attempt to improve refuse drain-and-rinse screening and to obtain longer screen life, stainless steel wedge wire was tested in April 1951. Four ¾-in. wide by ½-ft long sections were used. Each section was constructed with steel ribs parallel to the length of the screen, rising one in. above the surface, and spaced on two-in. centers. One-mm. opening wedge wire was placed between each rib.

Thirty minutes after plant opera-

tion began, it was observed that the medium hopper beneath the feed end was plugged with small flats approximately one mm. by ½ in. in size. The medium circuit became contaminated when these small flats plugged the diffuser plate through which the upcurrent enters the washer. Frequent flushing was required during operation. It was difficult to hold the required specific gravity and an excessive amount of magnetite was required. Because flat pieces of refuse persisted in going through the wedge wire, it was apparent at the end of 18 hours that operation was impossible, and the original screen cloth was put back in service.

Refuse from the drain-and-rinse screen discharges on to a 36-in. collecting belt conveyor. All plant refuse is collected on this conveyor. It is 112 ft long, inclined upward at 18°, and handles a maximum of 350 tph of 8-in. by 0 refuse at a belt speed of 386 fpm. The belt is 6-ply, 32-oz. duck, class 1, with 3/16-in. and 1/16-in. back cover complete with breaker strips. Mechanical belt fasteners are used for splicing. Thirty, six in. diameter troughing idlers, two, six in. diameter impact idlers, eleven 5½-in. spiral return idlers, a 30 in. diameter by 39-in. crown faced welded steel head pulley, a 16 by 39-in. snub pulley, and a 24 by 39-in. crown-faced, welded-steel tail pulley comprise the conveyor assembly. A 20-hp, 1750-rpm motor reduced through a 36.6 to 1 herringbone gear reducer drives the unit. Both head and tail shaft are ball bearing mounted.

All rubber spiral return idlers were worn out after 2704 hr service and replaced with 5½ in. diameter rubber disc idlers. Six of the rubber disc idlers were replaced after 3673 hr service. A seventh was removed after 4351 hr, and the remaining four were still in service after 6169 hr. The original belt is in service with 8873 hr, one splice was necessary to replace the original mechanical splice.

TABLE II—SIZE ANALYSIS OF MAGNETITE

Size	Weight Percent
Plus 60 Mesh	0.7
60 x 70 Mesh	0.8
70 x 100 Mesh	3.8
100 x 150 Mesh	6.3
150 x 200 Mesh	10.2
200 x 325 Mesh	13.4
Minus 325 Mesh	64.8

Medium Circuit

Magnetite medium flows in a closed system, circulating from the medium sump to the washer and return. See Fig. 3. Specific gravity is maintained by the return of cleaned, thickened magnetite from the rinse water circuit and the addition of new magnetite as needed. At 1.45 sp gr, approximately 6½ tons of magnetite is in circulation. The size analysis of the grind that has given the best results is given in Table II.

The magnetite medium storage sump is 10 ft in diameter at the top and 10 ft deep. The bottom outlet is equipped with an air-operated plug valve, which is open when the system is operating and closed when the system is not operating. The valve is automatic and electrically interlocked with the starter of the motor that drives the medium recirculating pump. The valve assembly and bottom of the sump are connected with compressed air lines to re-suspend the magnetite which settles to the bottom of the sump during idle periods. It is interesting to note the rapid settling in the sump. Tests show a 1.35 sp gr at the surface when the circulating medium is being maintained at 1.45 sp gr. The sump and plug valve have been entirely trouble free, requiring only minor maintenance.

A float has been installed in the sump to permit better control by the operator. This float operates a dial easily seen by the operator, showing the level of medium in the sump. It is also connected electrically to valves on a discharge pipe running from the medium hopper under the washer to the thickener, so that if too much water enters the circuit, it is drained automatically to the thickener. This float has proven very useful and assures much more even operation of the medium circuit. Excess non-magnetic fines as well as excess water are removed by this system.

Make Up by Hand

The original design for magnetite handling included a small hopper and a 5 in. wide by 15 in. long vibrating feeder for the constant addition of magnetite to the circuit. Seemingly possible, this was found to be impractical. Maintaining a constant specific gravity requires sudden magnetite addition to make up a loss, or, at the other extreme, complete stoppage when the system builds up. In addition, the small feeder was easily short circuited because of fine magnetite dust in the surrounding air. Use of the unit was soon discontinued. All make-up magnetite is now added by hand as required.

Medium is circulated by a 10-in. intake, 8-in. discharge centrifugal pump, specified to handle 1800 gpm of minus 150-mesh magnetite suspended in water at 40-50 percent solid density. It operates at a total head of 32 ft and is driven at 520 rpm through a V-belt drive by a 50-hp, 1160-rpm motor. The impeller and casing ring are of Ni-hard material and the shaft sleeves are of chrome-iron. Seal water is applied to the packing. This pump has given excellent service. Experience, however, soon indicated the advisability of a spare unit permitting complete replacement when signs of wear are shown. After approximately 3000 hr of service, a reduction in pump output volume is noticed. Then the pump is replaced by the spare unit. The removed pump is overhauled, the impeller, casing ring, and sleeve being replaced. Every other overhaul (6000 hr) requires a build-up of the casing. The pump is then subjected to a 120 possible leaks. This testing is important to maintain highest efficiency. Routine maintenance consists of

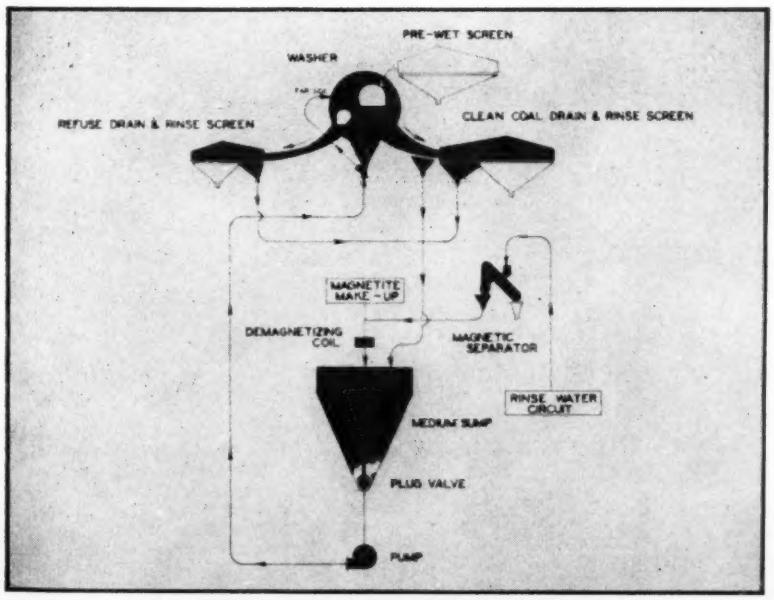


Fig. 3—The magnetic medium circuit is a closed system

checking the impeller clearance once a week. When the plant was first operated, considerable packing trouble was experienced. This was found to be due to incorrect seal water pressure. A small head tank was then installed to maintain a constant 20 psi pressure. The tank also serves as a means to determine the condition of the shaft packing. By stopping the water intake and noting the rate of fall in the head tank, the condition of the packing can be judged.

Changes in Diffuser Plate

Circulating medium enters the bottom of the washer through a diffuser box. The diffusing action keeps the bath in a constant well-mixed condition, and the jet action through the diffuser plate holes frees entrapped coal fines and near gravity material from the feed material passing across the bottom. Originally the 23 by 82-in. diffuser plate had ¼-in. diameter holes. This size hole, and a later change to 5/16-in. diameter hole, required considerable flushing because coarse fines kept blinding the perforated plate. After experimenting, a ⅜-in. diameter hole was adopted. This eliminated blinding and back flushing is seldom needed. In addition, the diffuser area has been reduced to 60 percent of the original area. A three-in. strip was taken from the feed side and a seven-in. strip from the refuse side. The concentration of the diffusing action reduced the float in the refuse immediately without affecting the sink in the washed coal.

A portion of the circulating medium enters at the surface of the bath. The current produced pushes the clean coal from the washer. At the point of entrance of the cross current, samples are taken for specific gravity checks of the medium. An automatic specific gravity recording meter, with dip tubes immersed at the center of the washing bath, has given satisfactory performance. However, the operator checks the specific gravity by hand several times a shift, using pulp density scales.

Medium discharging with both the coal and the refuse is immediately drained off on the first section of each drain-and-rinse screen into medium hoppers and then flows by gravity to the medium sump for recirculation. In the washing section of the drain-and-rinse screens there is a loss of magnetite and water from the medium circuit. The water entering the washer with the raw coal practically offsets the medium circuit water loss. Make-up water, as required, is added from a fresh water tap. Lost magnetite is replaced continuously by magnetite from the magnetic separator in the rinse water circuit. Make-up magnetite is added by hand as required.

The medium hoppers, and all other hoppers, are constructed of ¼-in. plate, with ⅜-in. liner plates, and have given satisfactory life. From experience at other operations the company proposes to line all hoppers with two in. of reinforced concrete.

Rinse Water Circuits

Fig. 4 shows the rinse water circuits as originally designed. To eliminate any possibility of getting slugs of magnetite into the drag tank and eventually into the final coal product, the pre-wet water circuit was divorced completely from the magnetite-bearing wash water circuits as shown in Fig. 5 and described in the following discussion.

Rinse water makes first contact with the raw coal on the pre-wet screen. Minus ¼-in. undersize is sluiced to a concrete reinforced sludge tank; 15 ft wide, 30 ft long and 6 ft deep. The fines settle out and are dragged forward and out by means of a flight conveyor passing over 18 sq ft of ½-mm. round wire screen. This was originally ¼-mm. opening; however, insufficient drainage resulted. Discharge is to the 36-in. coal collecting belt conveyor. The clarified overflow is re-circulated to the pre-wet screen.

The drag tank conveyor was designed with 10 in. wide, 3 in. thick, and 6 ft long cypress wood flights on 24-in. centers on 12-in. bar link chain. It is driven by a 5-hp, 1750-rpm motor through a 59.07 to 1 herringbone gear reducer and an 18.50 to 1 gear train reduction, obtaining a head shaft speed of 1.6 rpm. This results in a conveyor travel of 12 fpm with a maximum capacity of 17.5 tph. Actual sludge production is in the order of 8.5 tph.

Wooden Flights Floated

The wood flights were the only item of this unit which gave trouble. Since there were no hold down angles or wheels, the wood was buoyant enough to raise the conveyor off the bottom, permitting a build-up of solids on the bottom of the tank. These flights were immediately replaced with 1½-in. channel iron, thereby eliminating this problem. The chain sprockets are 24 in. pitch diameter, three-tooth, flame cut, and the surface flame-hardened. The drive shaft is supported on extra heavy, babbited, rigid bearings; the jack shaft is supported on medium duty ball bearing pillow blocks; and the tail shaft is supported on double strength babbited bearings with a 24-in. take-up. A third sprocket shaft is mounted below the surface of the water immediately below the tail sprocket shaft assembly and runs in manganese steel bushed pillow blocks. The drive arrangement and shaft assembly is grease lubricated and has been entirely satisfactory and trouble free. The only serious difficulty occurred in 1950 and was due to ignorance. The chain had frozen to the wear bar strips during the night. The operator, being new and not having checked for such an occurrence, started the unit. As the chain was frozen fast, the hold down bolts of the under water shaft assembly were sheared off. The tank was immedi-

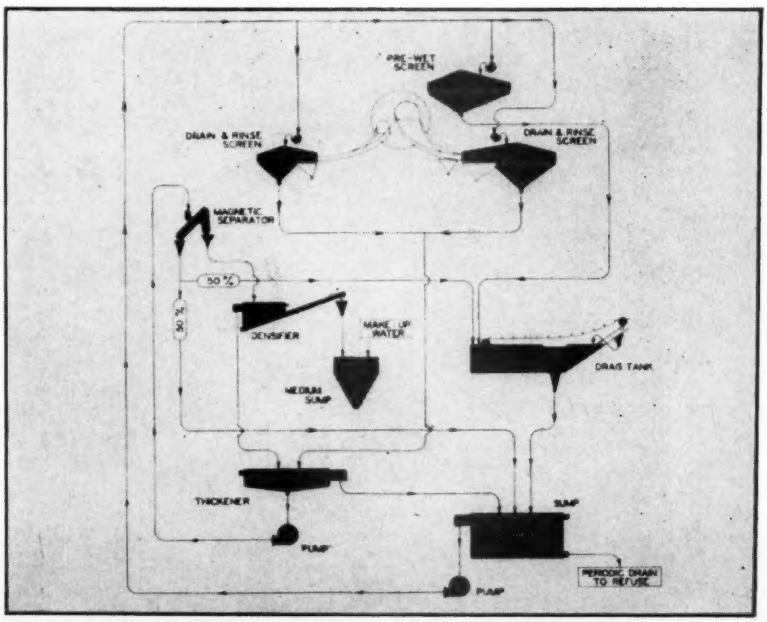


Fig. 4—Magnetite reclamation and water clarification circuits

ately drained and the assembly re-anchored. New mounting holes were drilled and threaded one-in. split roof bolts with the wedge were used as anchor bolts. The tank is now covered to prevent freezing.

Overflow water from the drag tank was originally flumed to a 10 ft square, 8 ft high water sump with a weir around the entire perimeter. The overflow provided approximately 438 gpm of spray water; 198 gpm to the pre-wet screen, 160 gpm to the rinse section of the clean coal drain-and-rinse screen, and 80 gpm to the rinse section of the refuse drain-and-rinse screen. Now the overflow from the drag tank is pumped by a three-in. suction, 2½-in. discharge centrifugal pump directly to the pre-wet screen.

In the rinse water flow change, all of the tailings from the magnetic separator were directed to the recirculating pump sump, adding an excessive amount of fines which periodically were flushed to refuse. An increased solids content was also found in the overflow rinse water. This created a critical condition and frequent flushing of the sump was necessary to maintain a satisfactory rinse. Magnetite losses increased and this condition is largely responsible for the higher magnetite consumption shown in Table III for 1952. Early in 1953 these tailings were diverted to the clean coal drain-and-rinse screen with the idea that the coarser of the fine solids would be filtered out and most of the fine magnetite returned to the system. Immediately magnetite consumption dropped, the rinse water became better, and the sump required draining only once a day.

Change Spillbox Design

Water from the clarified water sump discharges onto the screens through spill boxes as a full water curtain over the entire width of the screen. Maintaining this curtain was difficult and considerable experimentation was needed to do so. The original spill box design permitted dead areas, causing the settling out of fines with subsequent plugging over various lengths of the overflow weir. This caused a broken curtain of water and much of the material passing across the screen was not pre-wet or rinsed. The newly designed spill box is vented and the water flow restricted, causing an equal velocity across the entire length, producing a full water curtain.

The clarified water sump has a five-in. suction, four-in. discharge horizontal centrifugal pump designed for 400 gpm of water, containing 15 percent solids at a total head of 53 ft. The pump has a speed of 874 rpm and is driven by a 15-hp, 1750-rpm motor through V-belt drive.

Operating results at the plant have been excellent

Casing and impeller are Ni-hard material, and the shaft sleeve is stainless steel. Major maintenance has been repacking, this being required approximately every 200 hr of operation. The original design specified seal water. This was converted to a grease seal, doubling the packing life.

Rinse water from both drain-and-rinse screens passes through a magnetizing coil prior to entering the thickener. The thickener is 10 ft in diameter, 3½ ft deep and has a two in. per foot sloping bottom. The rake is driven by a one-hp, 420-rpm motor through V-belts providing 1½-rpm rotation. The unit has a rake lifting device for a total lift of 12 in.

Mechanically, the thickener has been trouble free; however, it is not big enough. This was soon realized and taken into account in the design of other company plants. Operation of this circuit is controlled by a valve at the base of the thickener to thicken the discharge to the desired solids content for feed to the magnetic separator. Operation is very critical, as the solids content in the overflow is easily affected. The thickener, as installed, is satisfactory, providing the system is operating on an even basis. However, with a variable coarse coal feed to the washer, there is inadequate spare capacity to handle surges of medium pushed out of the washer by an increase in feed.

It is interesting to note the volume change that occurs in the medium circuit when a heavy raw coal feed enters the washer. The extra material displaces medium in the washer and causes an immediate rise in the medium sump level. At times some of this excess is carried over into the wash circuit throwing an overload on the thickener and magnetic separator.

Thickener Operation

Thickener underflow is handled by a 200-gpm, 3-in. centrifugal pump. External packing seal water is used. In the beginning it was difficult to maintain the packing. This, as in the case of the medium pump, was found due to inadequate pressure. A constant head pressure tank was installed and packing troubles disappeared. A spare unit is kept on hand and complete replacement made when necessary. Complete overhaul is required after approximately 1500 hours' operation. Here again, pressure testing of the rebuilt pump has proven worth while.

Approximately 150 gpm of thickened material, varying between 50 and 60 percent solids, is discharged into the feed box of a 36 in. wide, wet-belt magnetic separator; the belt is inclined on a 45° slope. This unit is driven by a five-hp gear motor and chain reduction unit at 380 fpm belt speed.

The separator has given good service as a unit; most attention being directed to the small tooth chain sprockets. The anti-friction bearings have been trouble free. Electrically, there has been some difficulty. During first operation the magnetic pole shoes, beneath the belt, short circuited because of magnetite that found its way in from the edge of the belt. Operating efficiency was reduced, and a portion of the magnetite concentrate was lost to tailings. This was corrected by cementing the area between the pole shoes flush with the surface.

The first belt was changed after 431 hours of service because of pending failure of the straight splice. The replacement belt with a diagonal splice was removed after 3369 hours, and its replacement operated 4467 hours. Replacement of the belt is very difficult, requiring approximately 12 man-hours.

Feed to the separator is distributed evenly by a spill box across the width of the belt midway between the magnetic area of 12 magnetic fields. Magnetic material is caught in the magnetic field and carried upward from field to field by the belt. Non-mag-

netic material and water flow off the tail section.

The separator is overloaded much of the time and its operation is critical. Excessive fines in the system cause the over loading. This results in the bed on the belt becoming so deep that it slips off the tail section through shear weight. Magnetite is thus lost from the medium circuit. Before correction the concentrate had difficulty passing from the top of the magnetic field area up and over the head pulley, a distance of about nine in. At times of heavy feed the operator would push the concentrate over by hand. This was remedied by the installation of a paddle wheel above the belt rotating in the same direction as the belt. The paddles dipping into the material, to give the needed lift to get over the head pulley. Despite these operating difficulties the unit is very efficient in recovering magnetite.

Miscellaneous

An 8-in. diameter, 9-in. stroke, horizontal single-stage double-acting air compressor provides 108 cfm of free air at 100 psi discharge pressure. It is driven at a speed of 325 rpms through V-belts by a 25-hp 1750-rpm motor. This unit supplies the following equipment: feed hopper regulating gate actuating cylinders, raw coal scalping screen louver gate actuating cylinders, and dense medium sump plug valve and agitation system. In addition, air is piped throughout the building for miscellaneous use. It also supplies the aerial tramway braking system and discharge gates.

The compressor was originally placed in the washer building basement. Fine coal dust caused unnecessary maintenance. The unit has been moved to an outside building and is now entirely trouble free.

Dust collection equipment was installed and is now operating trouble free. A wet type dust collector, mounted above the drag tank, is used to remove the dust from the air at those points considered hazardous in the dry section of the plant. Dust amounts to about 300 lb per hr. A 5-ft diameter, 22-in. wide fan, running at 771 rpm through V-belts by a 100-hp, 177-rpm motor, operates the system. The original unit required considerable welding and additional bracing of the bottom hoppers. The system for the discharge of fines was to operate periodically. Because of build-up in the hoppers, this did not prove satisfactory. A system for continuous discharge of solids was installed. Approximately 25 gpm of water from the drag tank is passed directly through the dust collector hopper and returned to the drag tank.

As shown in Table III, lost time on accout of equipment failures is now less than one percent of the total available operating time. Most routine maintenance is done during the operating shifts since the plant is down an average of 1½-hr per shift waiting on coal.

When operating at 1.45 medium sp gr, the washed coal contains on the average 0.5 percent sink and the refuse 1.5 percent float; the testing being done at the same specific gravity as the specific gravity of the medium. This amounts to 0.7 percent misplaced material in terms of feed. The amount of near gravity material (±0.10 sp gr) in the feed at 1.45 sp gr averages 15 percent.

Presently the washer is being operated at 1.46 sp gr. It has been operated over long periods of time at 1.43 and 1.38 sp gr and experimentally at 1.35 sp gr. At low specific gravities there is little change in the percent sink in the clean coal as compared to operating at higher gravities. The percent float in the refuse increases slightly at the lower gravities. For instance, when operating at 1.38 sp gr (25 percent near gravity material in the feed) the clean coal contains less than one percent sink and the refuse approximately two percent float. Considering the wide size range of the feed to this washer and the large amount of near gravity material in the feed, this is excellent performance.

Magnetite consumption has always been low. Except for periods of upset circuits because of fines in the feed, consumption is well under 0.5 lb per ton of feed to the washer. Planned future changes in the medium wash water circuit should bring consumption to the order of 0.30 lb per ton of feed.

Presently the plant is being operated at an average feed rate of 240 tph—169 tph to the washer. It has been operated at rates up to 300 tph with no apparent change in efficiencies.

YEAR	OPERATION (HOURS)		DELAYS (HOURS)						PRODUCTION (TONS)					PLANT REJECT %	AVG. T./HR. WASHER FEED	MAGNETITE	
	AVAIL-ABLE	ACTUAL	POWER SERVICE	COAL FLOW	MEDIUM CIRCUIT	WATER CIRCUIT	R.R.CAR LOADING	WAIT ON COAL	WASHER FEED	WASHED COAL	WASHER REJECTS	RAW COAL FINES	TOTAL COAL			USED (POUNDS)	LBS./T. WASHER FEED
1949 (3 MO)	500	432	1	8	2	0	2	55	85,589	52,542	13,047	25,879	78,421	14.3	152	45,186	0.69
1950	2790	2365	1	23	12	13	1	375	436,462	356,599	79,863	194,814	551,413	12.5	185	254,550	0.58
1951	2888	2407	1	5	2	2	1	470	504,536	398,867	105,669	221,070	619,937	14.6	210	214,650	0.43
1952	2282	1853	0	5	3	13	1	407	403,544	320,081	83,463	163,791	483,872	14.7	218	246,550	0.61
1953	2911	2441	5	3	14	0	1	447	521,177	420,110	101,067	220,009	640,113	13.64	172	209,700	0.40
1954 (10 MO)	1936	1100	0	¾	1¼	0	¼	234	218,929	174,905	42,024	94,089	313,018	13.43	169	69,500	0.32
TOTAL	12,707	10,538	8	44¾	34¼	34	6¼	1988	2,150,237	1,725,104	425,133	919,652	2,686,780	13.9 AVE.	184 AVE.	1,040,136	0.51 AVE

Table III—Summary of coal washing plant operation

The magnetite concentrate, approximately 2.00 sp gr, discharges directly into the medium sump, thereby returning to the dense medium circuit. Originally the concentrate discharged into a twin screw densifier. The purpose of this unit was to feed, by means of the screws, a magnetite concentrate to the medium circuit with excess water overflowing from its surface returning to the thickener. The unit was originally designed with two 20-ft, twin 12-in. diameter discharging screws on a 27½° pitch from the horizontal. Operation was difficult because the solids would bridge over in the hopper, causing concentrates of lower specific gravity than the original feed to flow from the densifier. Consequently the unit was re-set at a pitch of 18° from the horizontal. The trouble continued. In the mean time it was discovered that the densifier could be by-passed and the unit has been eliminated from the circuit. Similar experience at other dense-medium washing plants of the company have shown that the densifier is not needed.

Results

The plant is giving excellent operating results. Washing efficiencies are good and there is little lost time because of mechanical or electrical failures.

A Description of The Pima Ore Body

Continued Exploration and Development Program Shows Orebody Is Bigger, if Somewhat Lower in Grade, Than Initial Work Indicated

By ROBERT E. THURMOND
Mine Superintendent
Pima Mining Co.

THE Pima Mine, near Tucson, Ariz., has attracted considerable interest and attention due to the fact that it is a new copper discovery and that it was discovered by geophysical methods.

Geophysical work which led to the discovery of this ore body was actually begun in June 1950. This, however, was preceded by a short period of geological reconnaissance which suggested eastward extension of the Mineral Hill trend. The geophysical work was begun by means of a reconnaissance magnetometer survey and, later, detailing and filling in those areas of interesting magnetic anomalies. (The relationship between magnetite and ore in this district had already been established.) Following the magnetometer survey, electromagnetic equipment was designed, built, and field-tested. An electromagnet survey was then made in those areas which showed interesting magnetic results. Anomalous electromagnetic trends resulted which coincided closely with the magnetic trends.

Interpretation of these geophysical results, considered in combination with the available geological information, led to the conclusion that diamond drilling was warranted. This was no easy decision to make since the nearest outcrop was some quarter of a mile away and the depth of the alluvial cover could only be estimated by resistivity work and geological extrapolation. The estimate was 200 ft with a possible error of 25 percent either way.

By February of 1951 the diamond drilling had begun. The first hole encountered copper sulphide mineralization at 255 ft, and the grade and thickness of mineralization seemed to warrant a systematic drilling program. Over the next ten months 18 holes were drilled and 16 completed. The total footage drilled was 7200 ft. A preliminary picture of the ore body had been developed and underground exploration and development was recommended.

Shaft sinking was begun in January 1952. By May 1952, the 400 station was completed. Lateral development was carried on concurrently on the 300 and 400 levels. Following the development of these two levels, nine diamond drill holes were drilled from the 400 level. These cut the structure beneath the 400 level at various depths down to the 600 level. The results of this drilling were sufficiently encouraging and the decision was made to deepen the shaft to the 600 level. Sinking commenced again in November of 1953 and the shaft was completed with stations at the 500 and 600 levels by April 1953. Lateral development of the 500 and 600 levels followed immediately.

At the time of writing, lateral development on each level is as follows: 300 level—1000 ft; 400 level—2000 ft; 500 level—1300 ft; and 600 level—500 ft. Additional lateral work is now being limited to the 300, 400, 500 levels, while the 600 level has not been extended in order to avoid the

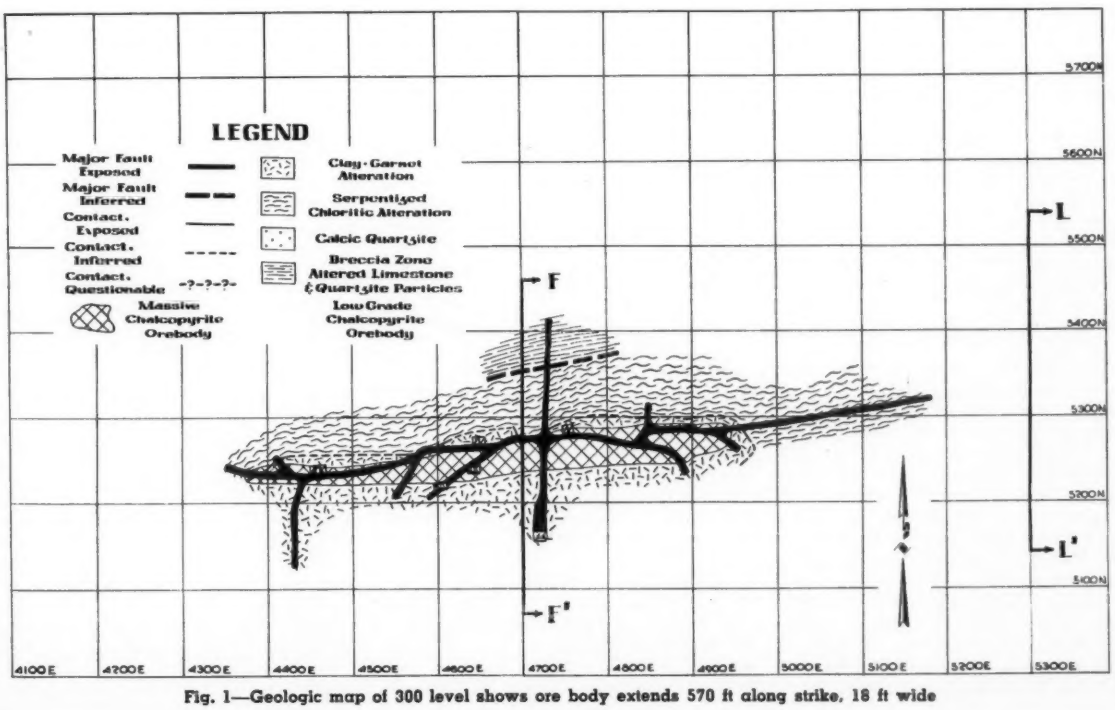


Fig. 1—Geologic map of 300 level shows ore body extends 570 ft along strike, 18 ft wide

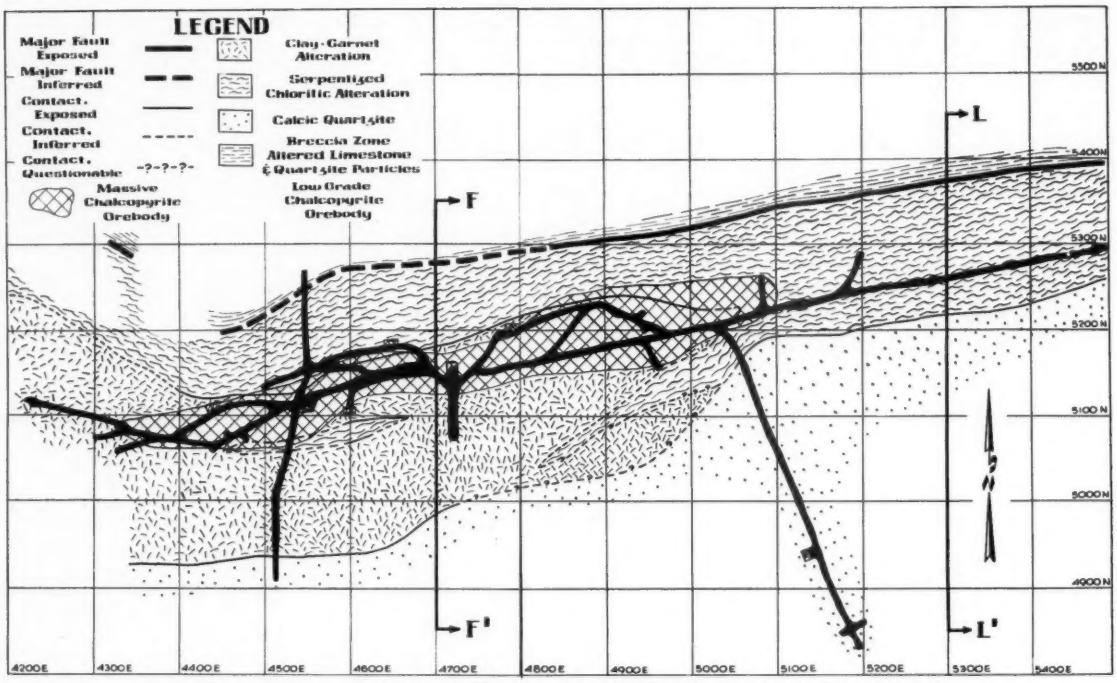


Fig. 2—Geologic map of 400 level indicates ore body with strike length of 790 ft, 42 ft wide

development of additional water. Exploration and development have been completed to the west where the property line has been approached. At the present time exploration is continuing to the east by means of both underground work and surface churn drilling.

With the beginnings of lateral development on the 300 and 400 levels, shipments of ore to the American Smelting and Refining Co. smelter at El Paso were started. These shipments have been continuous at the rate of approximately 125 tpd. Until April 1953, all of the ore was from development and exploration headings. Following this, stoping was started on a limited scale and the ore shipped was primarily from this source. Total ore shipped to date amounts to 58,500 tons, averaging just under six per cent copper.

Structural Relations

The nearest outcrop in the Pima mine area is some 1200 ft west of the shaft, and all of the mine area is covered by desert wash or gravel that is in most places 200 ft thick. Beneath this alluvial section the bedrock surface is fairly regular, dipping off gently to the north-east. The sedimentary rocks in the mine area are thought to be of Permian age. The sequence is as follows: a rusty brown quartzite; a thin bedded, serpentized, dolomitic limestone; a highly altered (clay-garnet) limestone, these overlain by a massive thick-bedded arkosic quartzite which varies from rusty brown to light gray. The bedding in these sediments, where it can be seen, dips to the south, 30° to 50°. The strike, in general, is just a little north of east.

The most striking structural feature is a broad breccia zone between the lower quartzite and the thin-bedded serpentized dolomite. This zone generally parallels the dip and strike of the adjacent sediments. The details of this breccia zone remain unknown for the most part since diamond drilling has never penetrated it, and it has been cut by cross-cuts in only two places. In general, however, it broadens to the east where it is over 100 ft wide, and narrows to the west where it is probably only a few tens of feet wide. It is composed of angular particles of both limestone and quartzite with a matrix which is partly calcite.

Host Rock Altered

The host rock of the massive chalcopyrite ore bodies is an intensely altered limestone consisting now of a mixture of kaolin and small garnets, with occasional remnants of calcium carbonate. The intensity of alteration has been extreme, probably first with garnetization and then with superimposed kaolinization. This type of alteration and its intensity suggests the possibility of an intrusive rock not far away. The main variation of this rock is a local gradation into a sandy facies of the altered limestone. Where the alteration has been less intense (usually beyond the extremities of the massive ore zone) the clay-garnet material will grade into marbleized limestone and metamorphosed dolomite.

Bedding is not discernible in the clay-garnet formation. It is generally a very weak, soft rock. The thickness of this formation is variable. In the western portion of the mine it may be as much as 200 ft thick. To the east the thickness diminishes to about 100 ft.

Underlying the clay-garnet formation is a thin-bedded dolomitic limestone which has been highly serpentized. This formation generally approximates the footwall of the massive ore bodies and closes around the ore at the east end. In some cases this rock also forms the hanging wall of the massive ore bodies though in such cases it is a very thin bed.

Local variations in this serpentized formation are numerous. Here again a sandy facies has been encountered. In places, zones of clay-garnet rock are interfingered with the serpentine. In fact, the contact between the clay-garnet formation and the serpentized limestone formation is distinct only where marked by a fault. For the most part it is a gradational contact with one formation fingering into the other. The thickness of the serpentized limestone varies from about 40 ft in the western portion of the mine area to as much as 200 ft in the eastern portion.

Where bedding is discernible, this formation is thin-bedded and dips to the south, 30° to 50°. No massive mineralization has been found in the

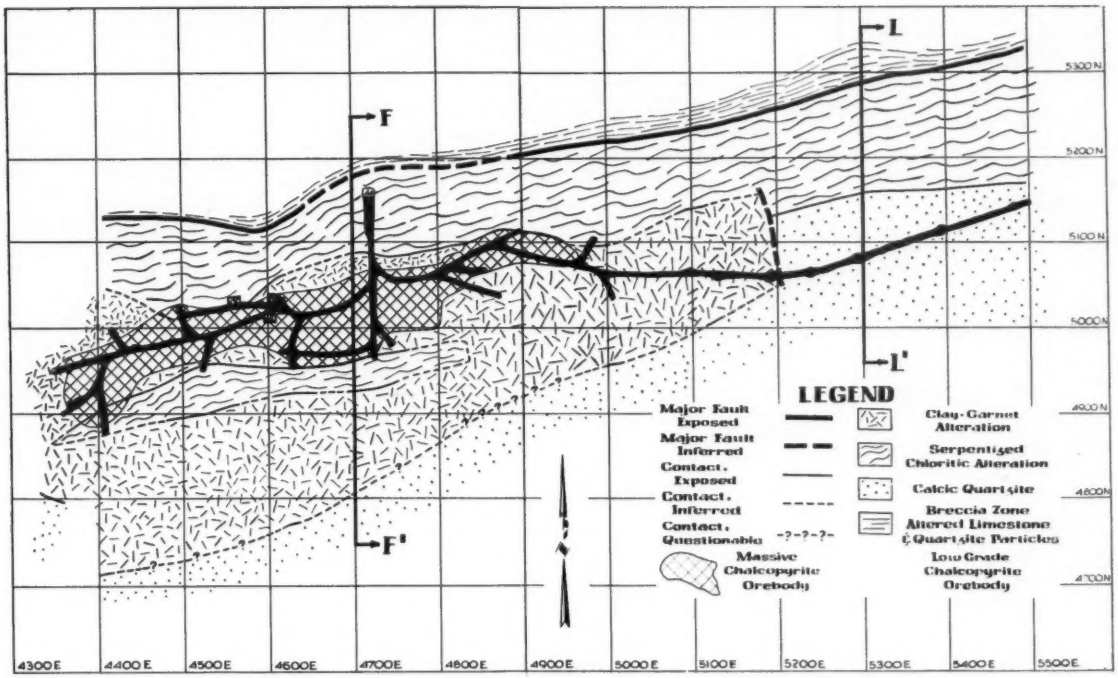


Fig. 3—On 500 level massive chalcopyrite ore body widened out to 54 ft and is 600 ft long

serpentized limestone. However, it is cut throughout by a series of small veinlets, usually conforming to the bedding. These veinlets contain both chalcopyrite and pyrite, along with some vein quartz. To the east this formation contains widespread mineralization as an extremely fine dissemination of pyrite and chalcopyrite. Magnetite is generally present, both as a dissemination and as massive lenses.

Underlying the serpentized limestone is a quartzite member; however, these two formations are separated by the wide breccia zone previously mentioned. Little is known about this quartzite since it has been cut in only a few places. It is a rusty brown and contains interbeds of calcareous material. To the east it is mineralized

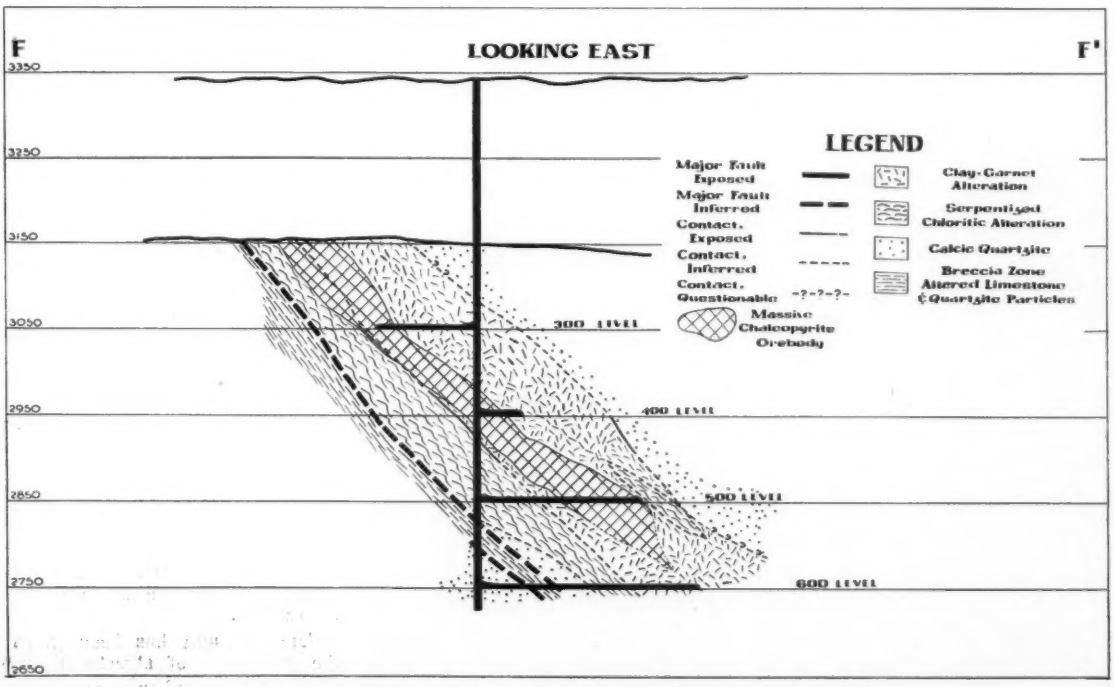


Fig. 4—Cross section F-F' shows general attitude of formation and ore body

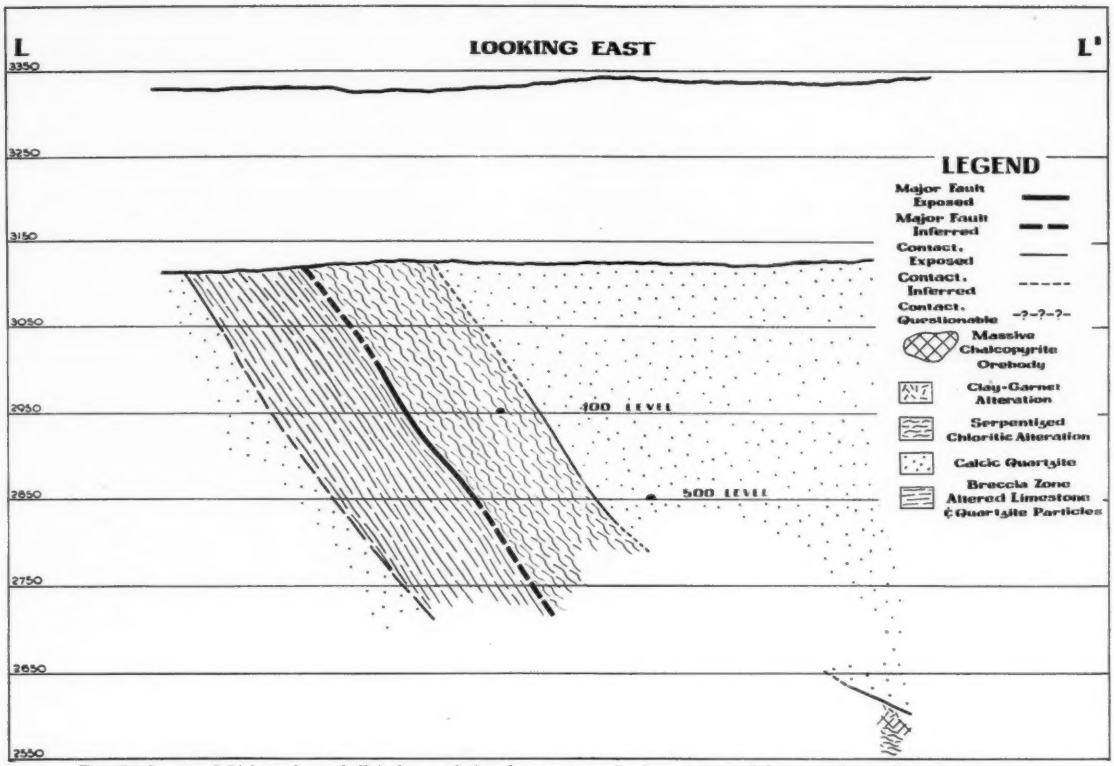


Fig. 5—Section L-L' based on drill holes and development work shows part of low grade exploration program

with disseminated pyrite and chalcopyrite.

Overlying the clay-garnet formation and generally in fault contact with it, is a massive arkosic quartzite bed. This formation includes many variations. These are probably due to difference in alteration intensity as well as to differences in the composition of the original rock before alteration. The more typical arkosic quartzite is metamorphosed consisting of quartz grains and altered orthoclase. In places this rock becomes calcareous and even appears to grade into a silicated dolomite. To the east this rock in places takes on an igneous appearance and contains an abundance of pink orthoclase. This abundance of orthoclase suggests the idea of injected orthoclase and silica from a nearby igneous source. In fact, on the 500 level to the east, and within this member mapped as arkosic quartzite there are places where the alteration becomes so intense that the rock is nondescript. It is felt that this highly altered rock may be either an igneous rock or a sediment that has been so changed by hydrothermal alteration that it can no longer be recognized. This latter condition would indicate a very near intrusive.

In the eastern portion of the mine where this formation is the more typical arkosic quartzite, it is uniformly mineralized with pyrite and chalcopyrite. This mineralization is along the seams of the rock as well as a dissemination throughout the rock.

No bedding has been observed in this formation. It is very blocky and brittle. The thickness of the quartzite has not been determined; however, in one place it is known to be more than 400 ft.

The High Grade Ore Body

The high grade copper sulphide ore body is a replacement by chalcopyrite in the clay-garnet material. In part, the replacement is almost entirely complete, which results in massive chalcopyrite with practically no other sulphides present. The best and largest example of this nearly complete replacement is immediately west of the shaft on the 400 level, and extends approximately 150 ft west from the shaft. This extremely high grade shoot extends upward to the 300 level where it tops out and continues on to the bedrock surface as a less massive portion of the ore body. This shoot extends downward below the 400 level, widening on the 500 level and raking to the east. The extension below the 500 level and to the east of the main cross-cut on the 600 level has not been investigated.

This shoot lies entirely within the clay-garnet formation with the serpentized dolomite forming its footwall. A very prominent fault structure forms the footwall contact between the ore and the serpentized limestone in this particular location. The dip and strike of the ore as well as the fault structure conform to the general attitude of the formation.

Within the high grade zone, there are numerous shoots and pods of massive chalcopyrite similar to this large shoot although all are smaller. Some of the smallest will measure only a few feet in each dimension.

Between these high grade shoots and pods and within the ore zone, the ore consists of disseminated chalcopyrite and a scattering of very small pods of massive chalcopyrite within the clay-garnet material. Within these areas of dissemination, some pyrite is present, both as small veinlets and as disseminated material. Scattered pods of zinc sulphides have been found within the ore zone, but these are of no economic significance. Some molybdenite occurs as plating along the minor slips within the ore zone, but this is also of no economic importance. The oxidation zone, although somewhat irregular in places, will average about 40 ft thick. The main ore minerals within this zone are native copper and chalcocite. Minor amounts of chrysacolla and azurite are present. Secondary enrichment below the oxide zone has been minor.

Some thought has been given to the possibility of structural control

(Continued on page 64)

Three continuous mining sections are producing 720 tons per shift

Mining at Bunker

Northern West Virginia Mining Operation Takes Every Advantage of Advancing Technology to Maintain Competitive Position

IF you take State Route 7 west out of Morgantown, W. Va., you cross the Monongahela River and travel up one of the long valleys that cross-hatch the country. It is Scott's Run — a place well known to the coal mining fraternity. For this is coal country. Not so many years ago (25 to be exact) there were 38 mines operating in the valley. To be true, some were small, but some were large too. Today there are two mines operating.

Conditions that have affected the coal industry adversely in recent years are reflected here. There has been a constant fight to reconcile shrinking markets with increased costs and only the strong have survived.

One of those that have survived and are still operating is the Bunker mine of the Trotter Coal Co. It is a slope mine operating in the Sewickley seam which runs between 48 and 60 in. thick. The mine is located at Cassville, W. Va., in the extreme north central part of the state.

What has kept Bunker running? Well, close attention to little cost-cutting details has helped, as has concentration on increased production by miners and mine management alike. Continuous mining has also helped and this article is devoted to a description of the method of continuous mining used there.

Install Continuous Miners

The first continuous mining machine, a 3-JCM Joy, was placed in operation in February 1953. At the present time there are three continuous mining sections in operation at the mine along with two conventional, off-track sections. Total production at Bunker runs about 1200 tons per shift with 60 percent of this coming from the continuous mining sections. Total daily production is 2400 tons.

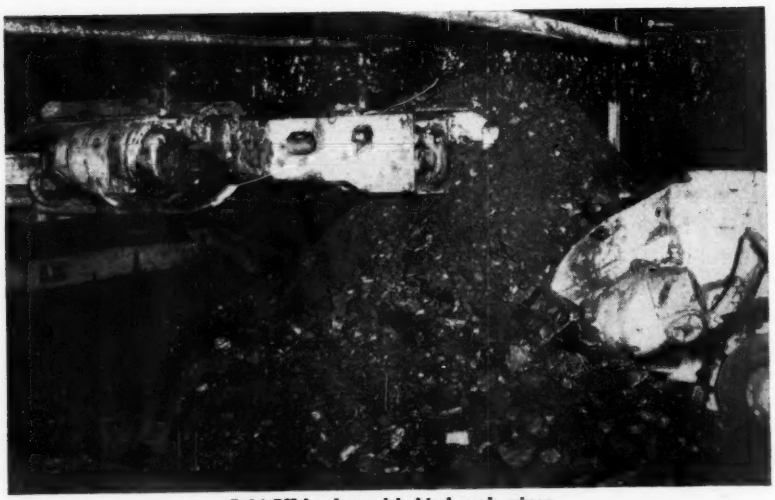
Mining is by a modified block system. Entries are driven 15 ft wide and crosscuts are made on 60-ft centers. If speed is essential, only four entries are advanced at one time. However, the normal method is to advance six or seven at a time. When pillars are taken, a 50 percent increase in production is realized on retreat. Cover averages 600 ft over the present working faces and the added weight on the coal makes cutting easier.

The continuous mining machines dump on the bottom. Coal is picked up from there by 14 BU loading machines and loaded into shuttle cars for transportation to a loading point where it is transferred to seven-ton capacity mine cars. There are two shuttle cars to each continuous mining section. Operating in the mine are eleven 6-SC's and one 5-SC.

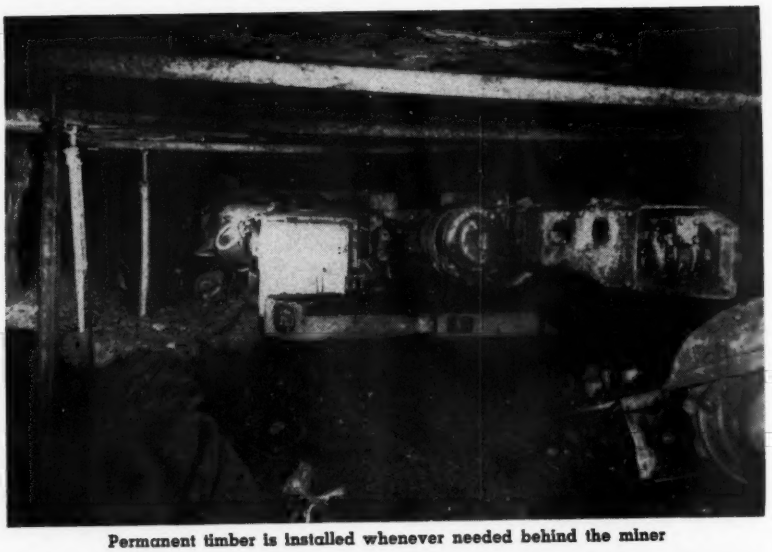
Haul to Mine Cars

One man is assigned to the loading head. His job is to run the six-ton trip motor and keep the general area cleaned up. Ten empties are placed at the loading head at one time. When the buggy operator is ready to have the trip advanced he pushes a conveniently located button to turn on a light that can be seen by the man on the trip motor. This light controls his action—when it is on, he advances; when it turns off, he stops.

Shuttle car operators also help shift loads out and empties in. When the last empty in a trip is spotted at the loading head, the buggy operator whose shuttle car is on the loading head at the time uncouples the empty and goes out with the loaded trip. The second shuttle car operator, as he approaches the loading head, parks his loaded buggy in a breakthrough. He then walks up and takes charge of the first shuttle car, running off whatever coal remains in the car into the empty spotted at the loading head. This is now his buggy and he takes it back to the face, leaving the loaded buggy for the first operator to pick up and empty as soon as he gets back with a trip of empty mine cars. In this way interruption to transportation of coal away from the miner because of switching trips of mine cars at the loading head is kept to a minimum.



A 14 BU loads coal behind each miner



Permanent timber is installed whenever needed behind the miner

Two shuttle cars haul coal on each section

Of course, the loaded car is now on the inby side of a trip of empties. And after each trip change, there is one more load added to the string. These are moved out at convenient times during the shift. The main purpose of all this is to keep the mine machine operating and not to allow haulage, or lack of it, to interrupt performance.

Auxiliary Operations

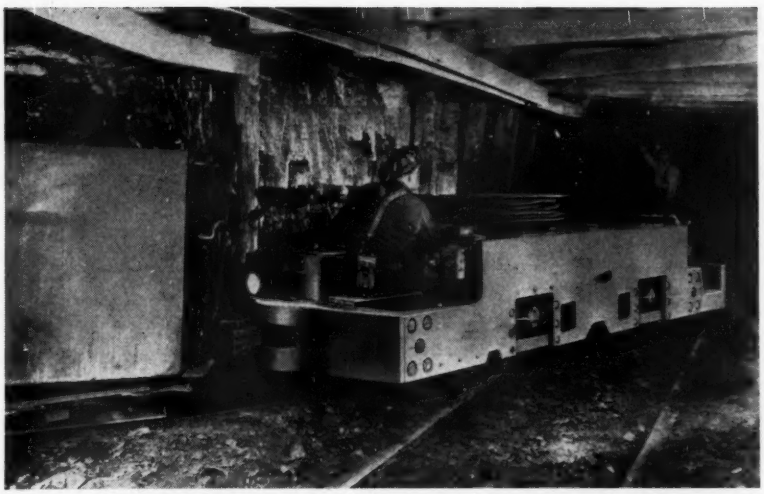
All power underground is 250 v., d-c. Power is purchased and rectified at the surface before being taken underground. One 400-kw mercury arc rectifier and four motor-generator sets are used for conversion.

The mine is gassy, a little over 1,000,000 cu ft of gas being liberated daily, and a rather unique method of ventilation is utilized. Air is furnished the underground workings through two air shafts. There is a fan at each shaft—one operating as a pressure fan and the other exhausting. The exhaust fan handles more air than does the pressure fan as it also pulls fresh air down the slope and along the main line haulage entries. The pressure fan handles 90,000 cfm of air at a water gage of two in. and the exhaust fan moves 170,000 cfm at 2½-in. water gage. Each section is operated on a separate split of air. When necessary, a brattice line is used to bring air from the last break-through to sweep the face and the machine.

Roof at the Bunker mine is generally good and on the continuous mining sections roof support is quite simple. Sawed timbers, approximately 4 by 6 in. in cross section and 14 ft long, are set on jacks as the machine advances, on about four-ft centers. A set of five cross-bars is used with each machine, the bar farthest outby being leapfrogged to the front of the machine as soon as a four-ft advance has been made. This might be termed first timbering. Permanent timber is set behind the machine as it is needed.

Little operating time is lost because of timbering. The timberman spots his jacks and carries the cross-bar forward. The operator then shuts down his machine just long enough to lift one end of the bar over the machine and hold it in place while the timberman tightens one jack. The second jack is set and tightened after the machine is put back into operation.

Dust at the face is controlled by the use of water sprays on the mining machines. Water is furnished from a large dammed area underground where all surplus water in the mine is collected for disposal, either to the surface or to the continuous mining sections. From the sump, water is pumped into the continuous sections where high pressure pumps pick it up and furnish it to the miners at 350 psi. On the sections, four, two and one-in. plastic pipe is used to carry the water.



Swing motors haul small trips between mainline parting and sections

Its convenience is as important as is its anti-corrosive properties. To move sections of plastic pipe from section to section is simple. All it takes is a mine motor to pull it along.

Haul Against Grade

The main line haul is three miles long with an average grade of 2½ percent against the loads. Three 23-ton motors are used on the main line for pulling trips and one 20-ton motor is used as a pusher. Three 10-ton and one 15-ton motors are used as pick-up or swing motors, shuttling between the mainline parting and the sections with loads and empties. As mentioned earlier, six-ton motors are used at the loading heads. Fourteen-car trips are handled on the main line with the pusher helping the loaded trips out. Although the average grade going out is plus 2½ percent, the last ½ mile is level. The purpose of the pusher is to assist in getting the loaded trips up the long hill and also as protection against a runaway trip in the event the trip becomes uncoupled on the way out. As soon as a trip is over the knuckle of the hill, the pusher is uncoupled and run back down the hill to help with the next trip of loads.

At the slope bottom the cars are run through a rotary dump and discharged into a 75-ton capacity bin. From the bottom of the bin a 48-in. belt feeds the coal to the 42-in. slope belt. This, in turn, puts the coal into a 40-ton capacity bin in the cleaning plant. The slope belt can handle 325 tph.

Cleaning Plant

In the cleaning plant the coal is first sent over a primary shaking screen where three sizes are made—plus 5 in., 5 by 1¼ in. and 1¼ in. by 0. The plus five-in. material is sent to a crusher and rescreened over the primary screen after crushing. The 5 by 1¼-in. fraction is fed to jigs. The 1¼ in. by 0 is screened again and a size separation made at ⅜ in. All of the 1¼ by ⅜-in. material is sent to one Roberts & Schaefer air table. The ⅜-in. by 0 is sent to four R & S air tables. Two products are discharged from the air tables, clean coal and a middling product. Middlings from the air table treating the 1¼ by ⅜-in. material are sent to the jigs and middlings from the four air tables treating the ⅜-in. by 0 are sent to four Deister Concentrator tables. Coal and refuse from the tables is dewatered over vibrating screens.

Coal from the jigs is dewatered over shaking screens and sized to specifications. Five sizes of coal can be loaded out at one time.

Dust from the air tables is collected by a cyclone settling system. Settlings can be sent to refuse or blended with the clean coal if quality warrants. Total refuse from the plant runs in the neighborhood of 10 percent and is trucked to a nearby disposal area.

The Future

To cut down on travel time of the miners, the company is constructing new portal facilities and a man shaft. The men now enter and leave the mine at the main slope and have to travel three miles to the working areas. A six-ft diam shaft has been core-drilled 465 ft to the coal and will house a two-deck, a-c powered elevator to transport men to and from the surface.

Trotter Coal Co. is looking forward to the future with optimism. That optimism, however, is based on continued hard work and efforts to stay in a competitive position. This philosophy is perhaps one of the big reasons that they are still operating in an area that has seen other mines closed in the recent past.

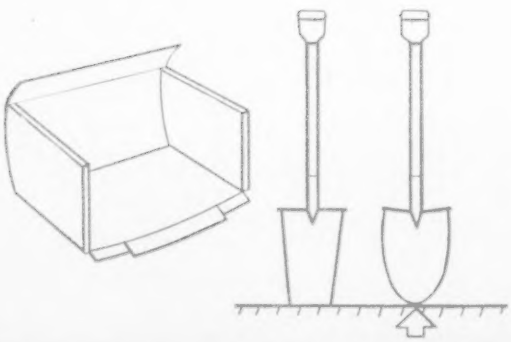
James F. Trotter is president of the coal company which has its main office in Morgantown, W. Va. E. W. St. Clair is general superintendent, L. A. Connor is superintendent and mine foreman, and Frank Povroznik is master mechanic and chief electrician. All coal is sold through the Davis-Wilson Coal Co., Morgantown, W. Va.

Sawed cross-bars are "leap frogged" forward as the machine advances

Compare these dirt

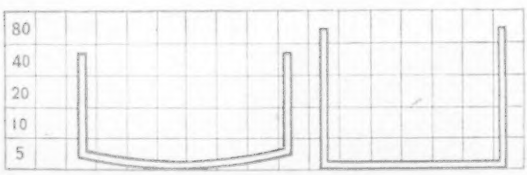
PENETRATES FASTER

Curved and offset cutting edge on Allis-Chalmers Motor Scrapers concentrates all the horsepower on the center section during initial penetration. The penetrating ability of a round-end spade helps illustrate the practical soundness of this Allis-Chalmers design.



LOADS FASTER

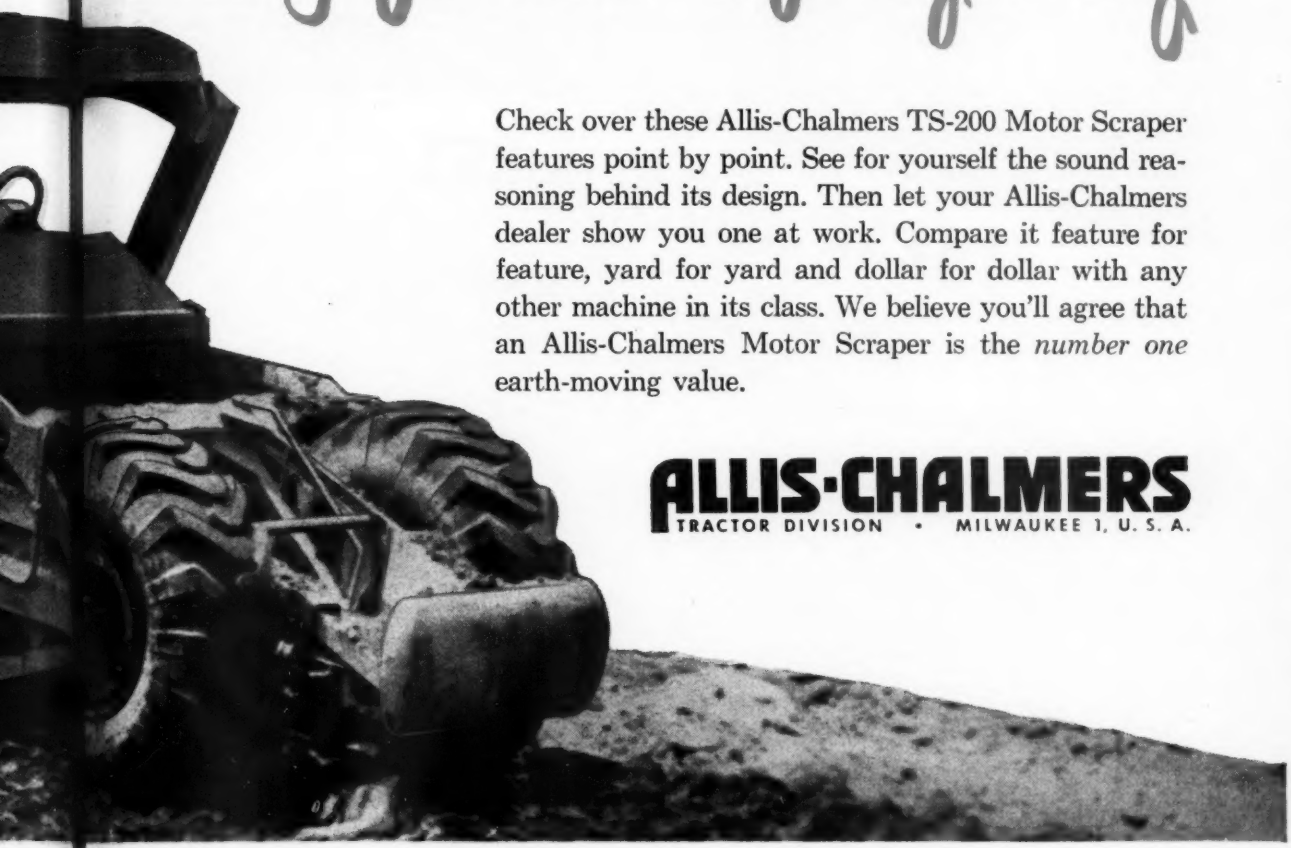
Low, wide bowl plays an extremely important part in ease of loading. Tests have proved that loading resistance is largely determined by the height to which the load is built. New dirt entering the bowl must lift the load directly above it in order to make room for itself.



This chart shows how loading resistance continually increases as the load builds up . . . how the lower, wider bowl of an Allis-Chalmers Motor Scraper requires less time and power to get the same yardage.

PERFORMANCE MAKES DOLLARS

...rthmoving features before you buy



Check over these Allis-Chalmers TS-200 Motor Scraper features point by point. See for yourself the sound reasoning behind its design. Then let your Allis-Chalmers dealer show you one at work. Compare it feature for feature, yard for yard and dollar for dollar with any other machine in its class. We believe you'll agree that an Allis-Chalmers Motor Scraper is the *number one* earth-moving value.

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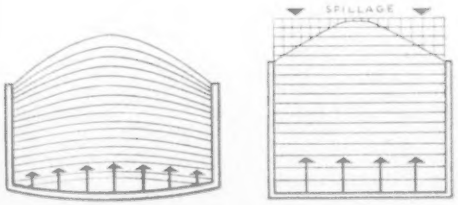
HEAPS AUTOMATICALLY

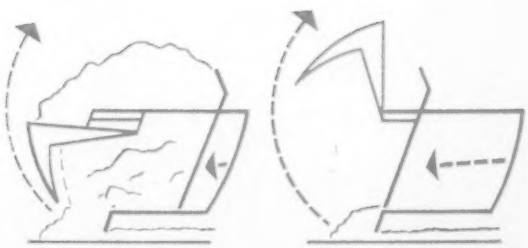
The combination of slightly deeper center cut and correctly angled cutting edge shapes the load as the scraper fills. The greater volume of dirt flowing into the center of the bowl "boils" forward, to the rear and to the sides, producing an automatically heaped load without excessive spillage.



These diagrams show how an automatically heaped load avoids costly spillage even though the center is built up above the sides of the bowl.

SPREADS EVENLY

Forward movement of ejector is timed with lifting action of apron, which provides a continuous flow of material to insure a smooth, even spread.



High apron lift prevents any possibility of material's jamming. Even when loaded from overhead, anything that can be put into the bowl can be easily ejected.

WHEN DESIGN MAKES SENSE

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Marlowe Coal Company.....(4)
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West Kentucky Coal Company

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Straight Fork Coal Company
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Butler Consolidated Coal Company
Cambria Clearfield Mining Company
Campbell Coal Company

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Blue Bird Coal Company
Carmac Coal Company
Chicago, Wilmington & Franklin Coal Company
Deer Creek Coal Company
Eddy Coal Company
Elk Coal Company
Freeman Coal Mining Corporation.....(2)
Mid-Continent Coal Corporation
Moffat Coal Company.....(3)
Old Ben Coal Corporation.....(3)
Peabody Coal Company
Pine Bluff Coal Company
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Sahara Coal Company
Truax-Traer Coal Company
Union Colliery Company
Wenneborg Coal Company
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Ingle Coal Corporation
Linton Summitt Coal Company
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Mountain State Mining Company
Nies Brothers
Northern Coal Company
Roundup Mining Company
Western Coal Company

WYOMING

Colony Coal Company
Ronocco Coal Company
Storm King Coal Company

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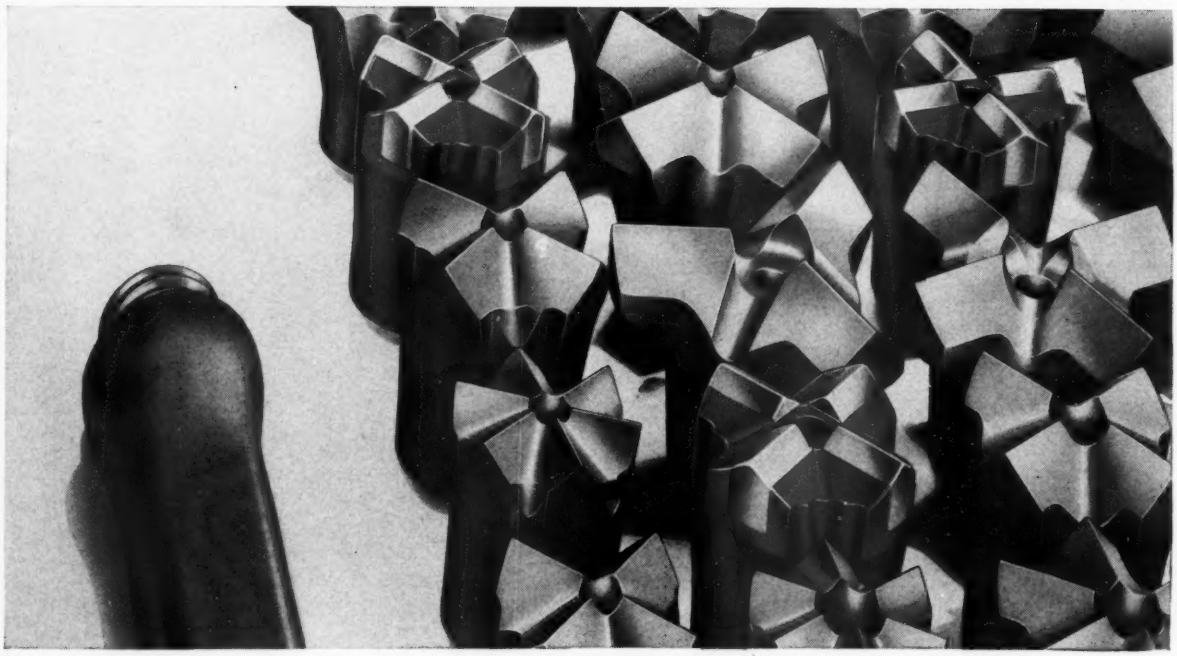

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The Connecting Link in Percussion Drilling

This is the second installment in a series of three on how to get the most out of hollow drill steel. The first appeared in November 1954 and the third will be published in the March 1955 issue of the Journal. The articles below deal with the development of materials and heat treatment of hollow drill rods.

Development of Materials for Hollow Drill Steel

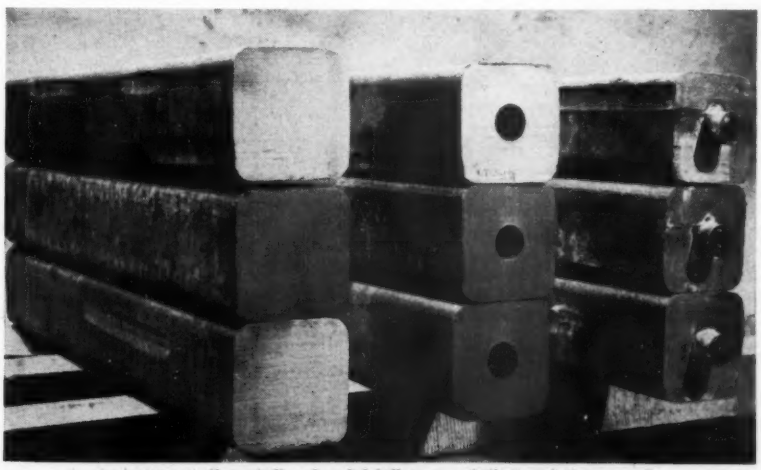
By W. F. TOWNE
Metallurgical Supervisor
Bethlehem Steel Co.

WHEN steel mills were first called upon to produce hollow drill rod material, the requirements were that the steel should not only have the strength and fatigue resistance necessary to withstand the service stresses of the rod, but it should also be suitable for producing a forged-on cutting bit which could be heat treated to a high hardness. Thus, chemistrywise, the plain 0.80 percent carbon analysis which had proven a satisfactory material for chisels, punches, battering tools and other shock applications was selected. This 0.80 percent carbon material withstood the test of time in service and is still used in considerable quantities today, especially by the construction industry.

In addition to selecting material of the proper chemical composition, the steel producers were also required to develop manufacturing procedures to produce hollow drill steel bars with smooth bores, minimum decarburization, and ultimately controlled hardenability. The first manufacture of hollow materials dates back to nearly 100 years when James Newman of England produced lap welded skelp tubes which were filled with sand and then rolled to smaller diameters. In 1911 Young & Rowlands of Sheffield, England, patented a method of manufacturing hollow metal rods from billets or ingots formed with a central hole. The holes were packed with refractory material and rods were then rolled. The patent covered primarily the removal of the refractory from the rolled hollow drill bars. This Young & Rowland's process was the first method extensively employed in making hollow drill steel. Somewhat later hollow drill tubes were produced on the Mannesmann seamless tube mill. None of these methods produced hollow drill bars with bores sufficiently smooth for good fatigue life. In 1928 the Bedford Co. of England produced hollow drill steel by the "copper core" process. The advantages claimed were that the hole in the drill steel was more centrally placed and the bore smoother. The same year, Bethlehem and other producers were experimenting with various core materials. In 1930, Robert Hadfield patented an austenitic manganese steel for use as core material in the manufacture of hollow drill steel. Bethlehem continued experiments with high nickel, stainless steels, and modified austenitic manganese steels. The austenitic manganese with 3¼ percent nickel proved to be the most suitable and was adopted as a standard by Bethlehem in 1932.

Requirements Change

Up to this time the characteristics required of hollow drill steel were that the material be heat treatable to produce the desired hardness on the bit end, and at the same time producing satisfactory hardness on the shank end. The introduction of the detachable bit about 30 years ago presented many advantages; one of these was that the rod no longer had to be a heat treatable bit steel. The more recent development of carbides for rock cutting with their relatively high cost and further development of many different designs of bits and methods of bit attachments made it desirable that material be developed specifically for use as a hollow shank. The consideration of a hollow shank rod independent of the bit made possible development of the characteristics of a



In making hollow drill rod, solid billets are drilled and then cored

theoretically ideal material. The major characteristics of the ideal material for hollow shanks are:

(1) Easy forging—affording high production with long die life on sharpeners or upsetters. In general low carbon material with little or no alloy content offers the best combination to meet this requirement.

(2) No tendency to produce tightly adhering forging scale — to avoid rough forged surfaces which present focal points for fatigue failures. Compositions which produce tightly adhering scale should not be used unless some way can be found to prevent such scale.

(3) Ability to produce a readily machinable hardness by slow cooling after forging. A low alloy content and relatively low hardenability is essential for this quality.

(4) Resistance to decarburization at rolling, forging and treatment temperatures. Low carbon and low silicon content are important to meet this condition.

(5) Ability to be air hardened from a relatively broad range of hardening temperatures. A low carbon content in combination with the proper balance of alloys is important to meet this requirement.

(6) Toughness, in the as quenched condition eliminating the need for tempering or drawing. A careful selection of carbon and alloy ranges is important for this property.

(7) Ability to harden in a range sufficiently high to produce great fatigue and wear resistance but not high enough to cause damage to the pistons of the drilling machines, especially when the steel is used in the as-rolled condition for stoping. A close control of hardenability, through control of the alloy additions, is imperative to produce this feature.

(8) Sufficiently high in hardness to resist thread wear when the shank is used with the threaded types of detachable bits. A high carbon and a relatively high alloy content can help in resisting wear.

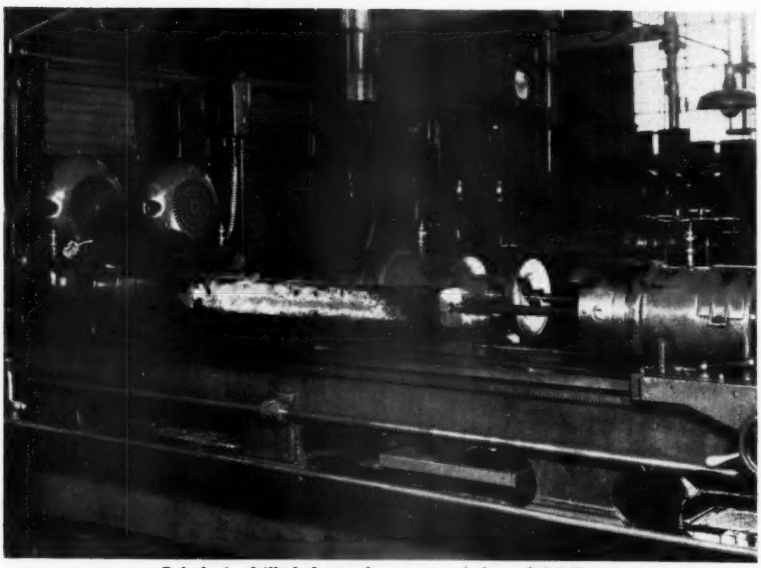
(9) Corrosion resistance for locations where water corrosion is a problem. This characteristic is difficult to attain with the ordinary low alloy steels in general use for drill rods.

(10) Suitability for use with a variety of types of bit end attachments.

(11) Not requiring alloys which will be in short supply in event of a national emergency.

(12) Finally the rods must be fabricated of the material which is most satisfactory for an economical drilling operation.

Consideration of the requirements for an ideal hollow drill material and its use with many varieties of bits and bit attachments brings the realization that the best results can only be obtained by the best compromise of all these factors. The compromise most suitable for one set of drilling conditions may not necessarily be optimum for another set of conditions.



A hole is drilled down the center of the solid billet

Steel producers have been acquainted with mining's requirements for hollow drill steel for many years. There are essentially three general types of material which have been subjected to sufficient service to enable the prediction that under suitable conditions one of them can be expected to produce reasonably satisfactory results.

After pointing out the requirements of an ideal material for hollow drill steel and the materials which are presently available, it is suggested that a conservative attitude be adopted with respect to the use of sizeable quantities of any material not generally recognized as a standard. This suggestion is based on experience with the nickel-chromium-molybdenum type steel.

When this material was first tested it showed considerable promise in many locations. However, after the test of time it was learned that the material continued to do an outstanding job in only relatively few places. The development of the nickel shortage during and after World War II caused this grade to be temporarily discontinued.

Type D steel, although produced in quantity by Bethlehem 15 years ago for use in foreign countries, was not widely used here until after the development of carbide inserts and their subsequent extensive use. The development of carbide inserts for bits

After the billet has been rolled into a drill rod the core is removed

HOLLOW DRILL STEEL
TYPICAL CHEMICAL ANALYSES

SLIDE 4

Steel	C.	Mn.	Si.	Ni.	Cr.	Mo.
A	.80	.20	.15	—	—	—
B	.30	.95	.25	2.25	.65	.30
D	.95	.30	.25	—	1.30	.35
E	(.30	1.00	.25	—	2.50	.55
	(.25	.80	.55	—	1.90	.30

made the type D steel very popular, so that now types A and D are the two most extensively used present-day materials.

Use or Abuse Important

Further consideration of the development of materials for hollow drill steel calls our attention to the numerous variations in the fabrication and application of the rods. These major variations occur in:

(1) Forge and treatment facilities and practices in the different shops.

(2) The sizes of drilling machines used and their maintenance.

(3) The care exercised in setting up the drilling machines and collaring holes.

(4) The control of air pressure to the hammers.

(5) The sizes and lengths of the drill steel used.

(6) The size, type and maintenance of the bits.

(7) The drillability of rocks.

(8) The presence or absence of water corrosion.

(9) The care exercised in handling the drill steel both in storage and at the drilling operation.

(10) Whether or not some form of cold working of the rod is employed.

Nearly all of these factors are important to the service of the hollow drill rod material, and all are mentioned because they are largely beyond the control of the steel producers. It is generally recognized that in order to obtain the best results each step in the making of a hollow drill rod, from the melting of the steel to its final application, must be properly and carefully executed.

Devise Laboratory Tests

In the past, many efforts have been made to develop a laboratory test which would furnish a basis for predicting the service life of drill rods. Some of the tests investigated include: Stanton repeated impact test, damping capacity tests, R. R. Moore fatigue tests, block tests (steel block) and simulated service tests (in granite block).

Although the block tests and simulated service tests helped to improve the general quality of drill steel, all of the above tests have proved inadequate in predicting drill life under actual field conditions. In fact, it has been our experience that actual field service data from various mines show conflicting results. This emphasizes the need for a large volume of service performance data in evaluating a standard material.

Due to the recognized value of a laboratory fatigue test which simulates actual field service tests, the search for such a tool continues. T. W. Wlodek, Research Metallurgist of the Canadian Department of Mines and Technical Surveys has developed a modified Sonntag rotating beam fatigue testing machine for drill rod materials. This machine is reported to show promise. However, the facilities and tests available to the steel manufacturers are limited and authoritative information must ultimately be supplied by the mining industry from actual service performance.

The foregoing information serves to explain the complexities involved in the development of materials for drill steel and emphasizes the conclusion that we should not discard a material because "we tried it once and it didn't work." Changes in fabricating methods, facilities, drilling machines and bits may make it possible for a material to give highly satisfactory service under the changed conditions. Thus it is emphasized that though many old and new analyses of steel have been tried, the search for a superior hollow drill material continues and several investigations are now in progress. Should any of these show promise it is planned that much service performance data be obtained under a variety of conditions, before such a material is adopted as a standard grade and broadly recommended for use as a hollow drill steel.

Heat Treatment

By PETER PAYSON
Assistant Director Research
Crucible Steel Company of America

THE purpose of heat treatment is to produce in steel a desired condition which it did not have before heat treatment. For example, steel after it has been forged is generally too hard for good machining, and therefore we heat treat it to make it easy to machine. The heat treatment used for softening steel for machining is called annealing. As another example of heat treating, consider the threaded end of a drill rod. The annealing treatment which made it possible to machine the thread easily has made the steel too soft for good wear resistance against the harder thread of the detachable bit. In order to increase the hardness to develop good wear resistance in the thread of the rod, we use a different heat treatment called hardening.

It should be clearly understood that although we can improve the useful life of a drill rod by correct heat treatment, we can also make the rod useless by incorrect heat treatment. For example, if the threaded end of the rod is made too hard by heat treatment, the thread may chip or crack shortly after drilling is started with the rod, and then not only is the threaded end of the rod lost, but an expensive bit may be lost also. The men doing the heat treating must, therefore, know not only what treatment is beneficial, but also what treatment is harmful.

Heat Bright Red

The actual steps in heat treatment are fairly simple. They consist of heating the steel to a certain high temperature, generally around 1400 to 1600° F at which the steel has a bright red color, and then cooling it back to ordinary temperature. The cooling of the steel from the bright red heat has a very important effect on the properties of the steel.

Cooling can be made very fast by quenching the red hot steel in water; or it can be made quite slow by leaving the steel in the furnace in which it was heated, shutting off the burners and allowing the steel to cool down in the furnace. When the red hot steel is quenched in oil it does not cool as fast as when it is quenched in water. When the steel is cooled in still air, it cools much slower than in an oil quench, but much faster than in a furnace. When the hot steel is placed in an insulating material, for example, powdered mica, or lime, the cooling is at an intermediate rate between a free air cool and a furnace cool; and when the hot steel is placed in an air blast, the cooling is intermediate between an oil quench and a free air cool.

The temperature to which the steel is heated, and the rate at which the hot steel is cooled determine the condition of the steel after heat treat-

ment but all steels do not respond in the same way to a given heat treatment, and the selection of the heat treatment depends on the composition of the steel.

In the article, "Trends in Hollow Drill Steel," MINING CONGRESS JOURNAL, December 1952, McCormick and Persons showed five compositions designated A, B, C, D, and E. For the purpose of this discussion, three of these steels have been chosen, the analyses of which are shown below.

Grade	*C.*	*Mn.*	*Si.*	*Cr.*	*Mo.*
A	.75	.25	.15	——	——
D	.90	.35	.25	.95	.30
E	.25	.80	.55	1.90	.30

In order to illustrate the effects of heat treatment on these compositions, standard one-in. hexagon hollow drill steel was used, and pieces of each grade were heated and cooled under practically identical conditions.

Test Hardness

After each heat treatment, the pieces were tested for hardness on the Rockwell C scale. Hardness is a good indication of both machinability and wear resistance, as well as fatigue resistance, the lower the hardness the better the machinability, generally; and the higher the hardness, within limits, the better the strength and wear resistance.

For easy machining, the steel should have a hardness between C 10 and C 25 Rockwell. For good strength and wear resistance, the steel should have a hardness between C 35 and C 50 Rockwell. When the steel is much over C 50 Rockwell it is considered too brittle for drilling purposes.

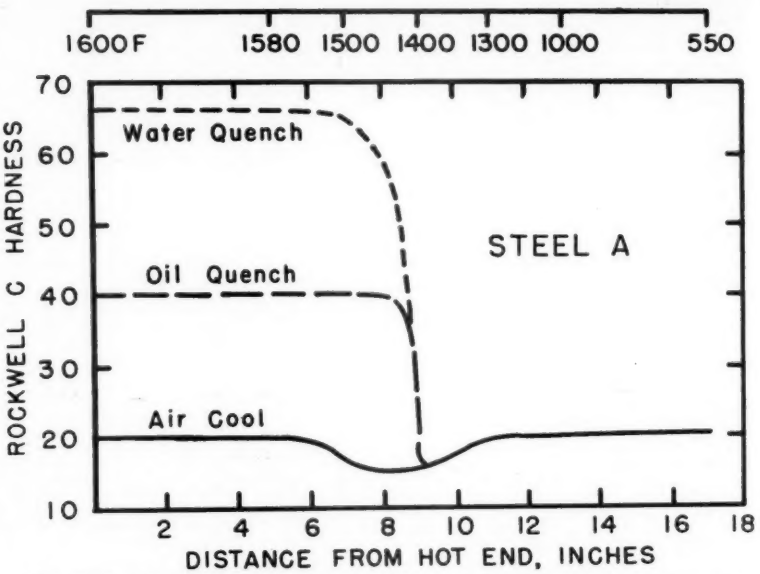


Fig. 2—Heating practices used in the field were approximated, specimens of Grade A steel were cooled and their hardness measured

To show the responses of these three grades of drill steel to annealing treatments, pieces were heated at 1450° F for one hr, and then one of each was cooled in free air; one of each in warm mica; and one of each in the furnace. The hardness results after these treatments are shown in Fig. 1.

It may be seen from this chart that the plain carbon steel, Grade A, is quite easy to anneal since all three pieces were between C 11 and C 20 Rockwell. The high C, Cr, Mo steel, Grade D, is a little more difficult to anneal since only the mica cooled and furnace cooled pieces were under C 25, whereas the air cooled piece was C 28. Finally, the low C, high Cr, Mo steel, Grade E, has a hardness under C 25 Rockwell only when furnace cooled, but when given this treatment its hardness is as low as that of the Grade A steel. All these steels therefore can be annealed satisfactorily with a slow cool from 1450° F.

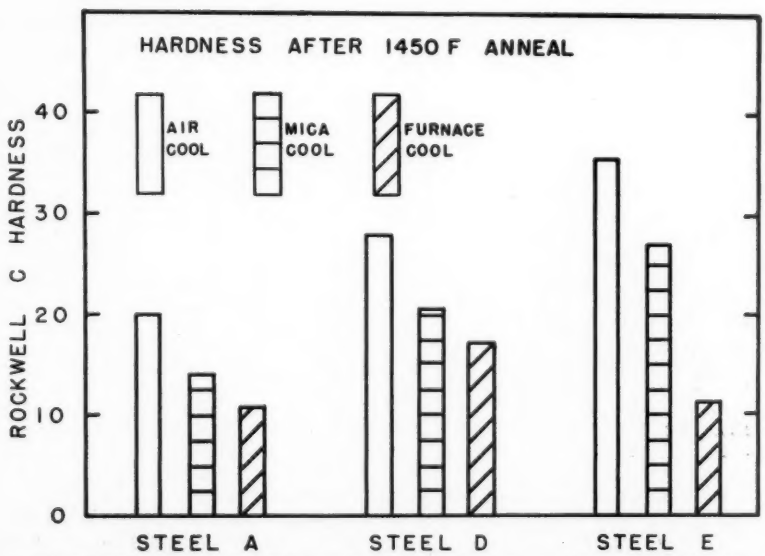


Fig. 1—After heating to 1450° F one piece of each steel was cooled and its hardness measured on the Rockwell C scale

Simulate Field Conditions

To show the effects of hardening treatments on these steels, and to duplicate to some degree the heating practices used in the field for hardening the ends of drill rods, pieces about 18 in. long were placed in a furnace at 1600° F so that only one end of each piece was at temperature, the other extending beyond the front of the furnace. By means of thermocouples and Tempilstiks temperatures were measured along the pieces from the hot end to the cold end. The temperatures corresponding to different distances from the hot end of the pieces are shown in the charts which follow.

Pieces of each grade were heated so that the hot end was at 1600° F for 20 min, then one of each was quenched in water; one was quenched in oil; and one was cooled in free air. Each piece was then tested for hardness over its entire length. The results of these hardness tests are shown in Fig. 2, 3, and 4.

Effect on Carbon Steel A

Fig. 2 shows the results for the carbon steel, Grade A. Rockwell C hardness is plotted against distance from the hot end of the bar, and the temperatures corresponding to these distances are shown at the top of the

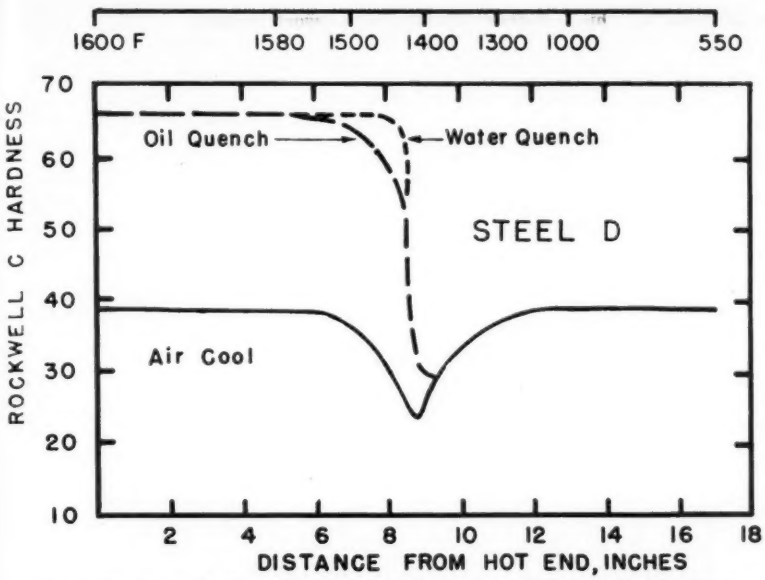


Fig. 3—Specimens of Steel D were heated in the furnace, cooled and their hardness measured

chart. It will be noted that the temperature was between 1580° and 1600° F for five in. from the hot end; then the temperature dropped off fairly gradually to about 1300° at a position about 11 in. from the hot end; and more rapidly from that position down to about 500° F at the cold end. Each piece was quenched all over, and the hardness curves show the effects of the quench from a range of temperatures.

Let us consider the changes as the temperature of the steel increases before it is quenched. The hardness at the cold end is practically the same as that of the natural steel and remains the same up to about 1100° F, and is not affected by cooling. When the temperature increases from 1100° to about 1350° F, there is a gradual decrease in hardness and again there is no effect of cooling. This softening that takes place when the steel is heated between 1100° and 1350° F is generally called tempering, although it might also be called annealing.

When the temperature is raised above about 1400° F, there is a tremendous effect of cooling on the hardness of the steel. When the steel is quenched in water from above 1450° F, its hardness is over C 60 Rockwell; when quenched in oil about C 40; and when cooled in air, only C 20, or below. When oil quenched from these temperatures this steel is suitable for drilling service; when water quenched, it is much too hard and brittle; and when air cooled, it is too soft. The temperature at which the very marked changes in hardness begin to occur when the steel is quenched is referred to as the critical temperature of the steel, and in this steel the critical temperature is about 1370° F.

Rather complex changes take place within the structure of the steel when it is heated above the critical temperature and is then cooled below this temperature, and these changes in the microstructure of the steel account for the differences in hardness which result on cooling.

Effect on Steel D

Let us now examine in Fig. 3 the results obtained on the high C, Cr, Mo steel, Grade D, when treated in exactly the same manner as the carbon steel, Grade A, was treated. Again, starting from the cold end, we see that there is practically no effect on the hardness of the natural steel of heating up to about 1100° F, and that the hardness decreases as the temperature increases from 1100° to 1350° F, and there is no effect of cooling from these temperatures. The drop in hardness on tempering is a little more pronounced in this grade than in Grade A, because Grade D in the natural condition is appreciably harder than Grade A, about C 38 as against C 20.

The critical temperature of this steel is also about 1370° F as was the case with Grade A. But the effects of cooling from above the critical temperature are quite different in this steel from those found in Grade A when an oil quench or an air cool is used, although Grade D has the same very high hardness as Grade A when a water quench is used. When Grade D is quenched in oil from temperatures over about 1475° F, it is practically as hard and brittle as it is when water quenched. On the other hand, when it is air cooled from about 1500° F or higher its hardness is over C 35 Rockwell which is suitable for drilling service.

This chart shows therefore that Grade D is not suitable for drilling service if quenched in water, or in oil, from 1600° F, but is satisfactory when cooled in free air. Note, however, that if the steel is cooled in air from between about 1450° and 1550° F, it will have a hardness below C 35 Rockwell and therefore will not be in its best condition for drilling service. With the carbon steel, an oil quench from any temperature between 1450° and 1600° F gives a satisfactory result, whereas with Grade D, the low-

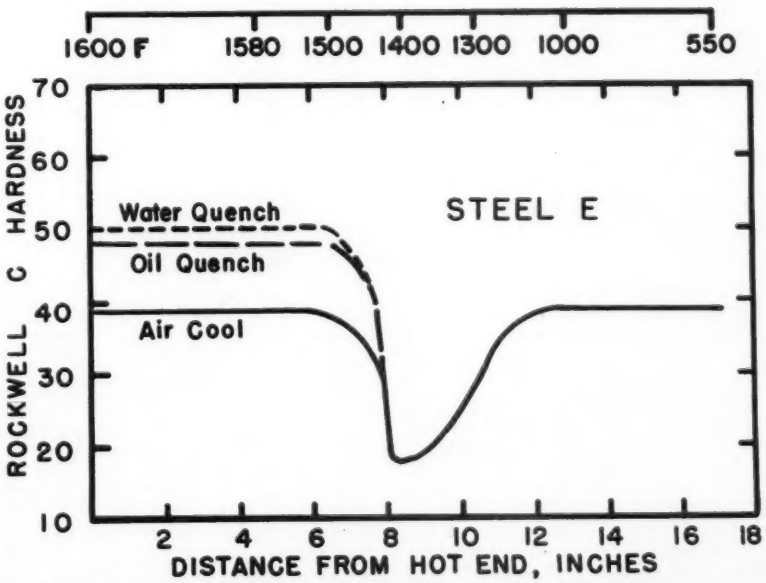


Fig. 4—Specimens of Steel E were heated in the furnace, cooled and their hardness measured

est temperature for satisfactory hardening with an air cool is about 1500° F. This steel therefore is less foolproof in its heat treatment than Grade A.

Effect on Steel E

The next chart, Fig. 4, shows the results of similar tests on Grade E. This steel also shows little effect of heating up to about 1100° F; and then a fairly marked tempering effect from 1100° to 1400° F. It should be noted that Grade E in the natural condition is much harder than Grade A and about the same hardness as Grade D.

The outstanding difference between Grade E and the other steels is that its hardness when quenched in water from 1600° F is not very much different from its hardness as air cooled from this temperature, namely C 50 as against C 38 Rockwell; whereas for Grade A the water quench produces a hardness of C 65 against C 20 for the air cool; and for Grade D, the spread in hardness is C 65 to C 38 after these treatments. In other words, Grade E has a satisfactory hardness when air cooled, but in contrast to Grade D, it is not too hard when quenched in oil, or even in water. At the same time it should be pointed out that best results with Grade E have been obtained with an air cool.

It has now been shown that because of differences in composition, these three drill steels respond differently to identical treatments. It is quite clear, therefore, that the heat treater must use the treatment best suited for each grade, and that he must be careful in controlling the heating temperatures as well as the cooling, in order to get best results with each steel.

For lack of space, there will be no discussion of the effects of over heating. However, in the heat treatment of drill steel heating above about 1650° F is generally undesirable.

Fully hardened steel can be softened by reheating it at fairly low temperatures. For example, Grade D when oil quenched from 1600° F has a hardness of C 65 Rockwell; but when the quenched steel is reheated for one hr at 900° F, its hardness drops to about C 50 Rockwell.

Metallurgical Notch

There is one final point which needs to be discussed and that is the overlapping heating procedure to minimize the metallurgical notch.

It has been shown that all steels are subject to a tempering effect when they are exposed to temperatures between about 1100° and 1400° F. In the treatment of drill rods by differential heating such as was used in the experiments discussed, this causes a narrow soft zone next to the hardened portion of the steel. This soft zone is referred to as a metallurgical notch because it has the same effect in producing fatigue failure as does a mechanical notch such as a chisel mark. This metallurgical notch cannot be completely eliminated by any treatment except over-all heating of the rod. However, the effect can be minimized by overlapping the heating. This consists of moving the rod forward into the furnace about three to five in. after the hot end has been at temperature for about 20 min, and holding it in this new position for between two and four min. This permits the steel which had been close to the critical temperature to be raised to a higher temperature which would cause it to harden during subsequent cooling. Of course, at the same time, the portion of the rod next to this zone on the cold side also has its temperature raised to a degree which would cause softening of the steel. However, this softening process depends on time at temperature, and since the time at this new position is quite short, the softening effect is not great. Therefore, by overlapping the heating, the difference in hardness between the hardened and softened parts of the rod is held to a minimum.

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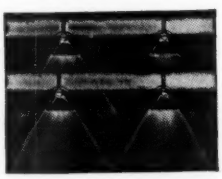

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Present trend is toward longer hauls, higher speeds, heavier locomotives and bigger cars

Determination of Proper Mine Car Capacity

Reports by the Haulage Committee Show Importance of Correct Balance Between Investment and Operating Costs for Modern High Capacity Rail Transportation Underground

By J. D. REILLY
E. T. LANG
and D. A. ZEGEER

THE present trend in underground rail transportation is toward higher tonnage, longer hauls, faster speeds, heavier locomotives and large capacity mine cars. Since mine cars are "custom built" and can be designed according to the operator's specifications, the purpose of this report is to point out the factors which might influence the decision as to the size and type of car that will best suit any given set of mining conditions. Length of haul, Grades encountered, Track construction and Tonnage to be handled during a shift should all be taken into account. There is also the question of how and where the cars are loaded; that is whether they are loaded individually at the face or in trips by some auxiliary gathering equipment such as shuttles or belts.

The committee feels that it is not possible to derive any formula that will definitely establish the type of transportation equipment to give the most efficient results. The plan for the report therefore is to present accounts furnished by coal mining companies which describe rail haulage installations with various sizes of cars, showing conditions under which they operate, giving cost and performance data, and indicating the reasons for selecting that particular equipment. Three such accounts—covering ten, thirteen and twenty-five ton cars—are submitted here with the thought that they may serve as a guide in designing an underground track haulage system.

In presenting this report, it should be emphasized that no recommendations are intended or implied. Furthermore, since different methods are used by each company in computing its costs, the committee especially cautions against making direct comparisons between the cost figures shown.

Mine A—10-Ton Mine Cars

This operation is in a 5½-ft coal seam with approximately one ft of draw slate that comes down when the coal is mined. The entire product is hauled to the tipple and cleaned mechanically—the first step in the cleaning process is a scalping screen where the large pieces of slate are removed. Total reject amounts to 40 per cent.

The mine produces 2600 tps of clean coal. With the reject, this amounts to approximately 4300 tons of material which is hauled in mine car

MINE A TABLE I — INVESTMENT

	Initial Cost	Years Life	Depreciation (7 months)
Mine Cars	$285,000	10	$ 16,625
Locomotives	78,000	10	5,141
Track and Wire	215,000	10	12,562
Rotary Dump	60,000	10	3,500
Total Depreciation—7 months			$ 37,828

MINE A TABLE II — OPERATING AND MAINTENANCE — 7 months operation

	Labor	Supplies	Labor Per Ton	Supplies Per Ton
Motor Crew	$ 34,509	$ 384 (sand)	$0.0645	$0.0007
Track, wiring, timbering	4,672		0.0087	
Roadway Maintenance	896		0.0017	
Locomotive Repair	2,517	2,548	0.0047	0.0048
Mine Car Repair	6,419	5,510	0.0120	0.0103
Taxes, Social Security, etc.	3,778		0.0071	
	$ 52,791	$ 8,442	$0.0987	$0.0158

MINE A TABLE III — COST SUMMARY — 7 months operation — 534,951 tons

		Per Ton Raw Coal	Per Ton Mile
Depreciation	$ 37,828	$ 0.0706	$ 0.0159
Operation & Maintenance	52,791	0.0987	0.0220
Maintenance Supplies	8,442	0.0158	0.0036
Power	5,760	0.0108	0.0024
Total	$ 104,821	$ 0.1959	$ 0.0439

trips to the rotary dump at the tipple. The average one-way haul is 4½ miles. Main line track is laid with 60-lb rail on treated ties and is rock ballasted. Main line trips have a speed of 14 mph hauled by a 26-ton locomotive. The cars are of steel construction with eight-wheel trucks and weigh 3.75 tons empty. A capacity of 10 tons makes a live-load ratio of 2.66 to 1. The cost of the cars per cu ft of capacity is $4.41 and $190.00 per ton of raw coal capacity.

Coal is mined by the room-and-pillar system. At the working face the coal is mechanically loaded directly into mine cars; each loader is served by an eight-ton locomotive. These haul to an intermediate side track and a 13-ton gathering locomotive delivers them to the main line parting.

The initial investment, based on September 1953 prices, is as follows: 190 cars at $1500 each; 26-ton differential main-line locomotives at $47,000 each; eight-ton section motors at $14,000 each and the 13-ton gathering locomotives at $17,000 each. The one-car rotary dump would cost approximately $60,000 to install today.

Main-line track initial investment is based on a cost of $5.39 per ft which includes all labor, track, ties, spikes, bonds, etc. The wire cost is figured at $1.33 per ft which includes all labor and the wire, hangers, clamps, etc. In timbering a figure of 2.37 per ft was used which includes all labor. The grand total per ft of main line is $9.09.

Mine B—25-Ton Mine Cars

This property is in mountainous territory and a large acreage of the coal seam lies within a comparatively short distance of the outcrop. Taking advantage of this situation, the projection planned to operate the first 10 years by so-called "contour mining"; an outside main-line track is laid from the tipple along the crop line with mine openings at suitable intervals into the body of the coal. Each of these openings consists of a set of three entries, with belt conveyor haulage, driven various distances as the property boundary determines. Coal is mined from rooms driven to the right and left. At the working faces, coal is mechanically loaded into shuttle cars which haul to a belt conveyor in the entry. This belt transports coal to the drift mouth and discharges into a trip of mine cars. At the loading station the trip is moved by an automatic control as each mine car is loaded. These openings all have a comparatively short life.

Cars are of all-steel construction, bottom dumping with eight-wheel trucks and weigh 10.5 tons empty. With a load of 25 tons, the live-load ratio is 2.38 to 1. Level full, the car has a capacity of 888 cu ft. A cost of $3,290 each (1952 prices) reduces to $3.70 per cu ft and $132 per ton capacity. Investment, operating and maintenance costs (for the main line haulage), are given in Tables I, II and III.

The mine produced at the time the estimate was made 3300 tons of raw coal daily in a three-shift operation. Reject amounts to 10 per cent, making a production of 3000 tons of clean coal per day. The ultimate length of underground main line track will be 3.52 miles; 42-in. gage laid with 80-lb steel rail on treated ties. A 20-ton tandem locomotive hauls the trips at a speed of 15 mph. With automatic loading stations, and with automatic car tripping and closing devices at the tipple dump, the main line requires

MINE B TABLE I — INVESTMENT

	Total Cost	Years Life	Annual Depreciation
Mine Cars	$197,000	8	$ 24,675
Rebuild Locomotives	16,000	12	1,333
Loading Stations and Dump	49,000	10	4,900
Main Line Track	193,000	30	7,360
Roadbed Grading	406,000	30	13,533
Total Annual Depreciation			$ 51,801

MINE B TABLE II — DAILY OPERATING AND MAINTENANCE

	Labor	Supplies
Motormen (3 Shifts)	$ 100.92	
Track, Wiring, Timbering	71.75	$ 32.00
Roadway Maintenance	101.71	16.00
Motor and Car Repair	35.20	14.00
Taxes, Social Security, etc.	31.96	
Total Daily Labor	$ 341.54	$ 62.00

MINE B TABLE III — ANNUAL COST SUMMARY — 733,000 tons raw coal

	Haulage Operating Costs	Per Ton Raw Coal	Per Ton Mile
Depreciation	$ 51.801	$ 0.071	$ 0.020
Operating Labor	77.339	0.105	0.030
Supplies	13.640	0.019	0.005
Power (est.)	7.740	0.010	0.003
	$ 150.520	$ 0.205	$ 0.058

only one motorman (at the present time) per trip for hauling, loading and dumping.

In planning the mining operation, a detailed study was made to determine the proper size mine car to use. For this particular location, and under existing operating conditions, cars of 25-ton capacity appeared to be the most economical. Preliminary estimates indicated a main line haulage cost of $0.069 per ton-mile for 10-ton cars as compared to $0.058 per ton-mile for the 25-ton type. This would mean an annual saving of $27,363.

Mine C—13-Ton Mine Cars

This operation produces 5400 tpd, dumping on two shifts. The seam mined is the Pittsburgh No. 8, which has an average height of 60 to 64 in. with an additional 6 to 10 in. of draw slate that is loaded with the coal. The seam rises approximately 50 ft to the mile in a northwesterly direction; the main line haulage is from west to east with loaded trips. Main line track from the rotary dump at the bottom to the inside parting is 4.6 miles long, with 60-lb rails on wooden ties. Sixty-lb rails are being replaced by 80-lb iron. Two 25-ton main line locomotives haul the loaded trips at a speed of 12 mph—an average trip has 23 cars with a total of 300 tons of coal.

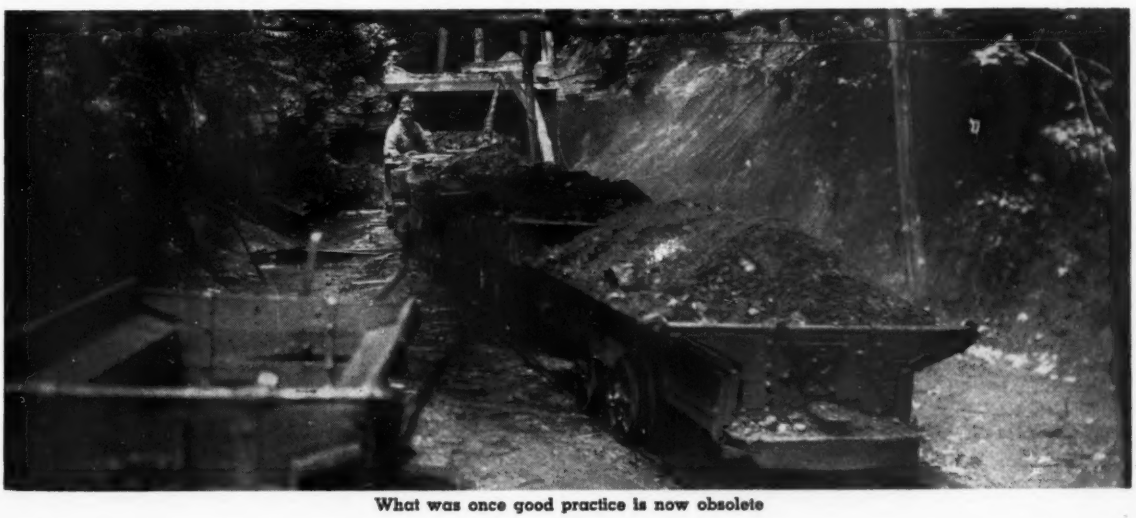
Coal is mechanically loaded into shuttle cars. These haul to the entry track where an elevating conveyor loads mine car trips. The cars are of steel construction, with eight-wheel stub axle trucks. The empty car weighs 4.5 tons and carries 13 tons of raw coal, making a gross weight of 17.5 tons. Live-load ratio is 2.89 to 1. The cars have a capacity of 395 cu ft and cost $1300 (1953 price). This gives a cost of $3.29 per cu ft of capacity or $100.00 per ton of raw coal capacity. In Table I is the cost per ton mile based on factors shown.

Low type high-capacity cars are used in thin seams

MINE C TABLE I

a. Initial investment			
Mine cars	$0.0043		
Locomotives	0.0011		
Rotary dump	0.0015		
Main Line track	0.0040		
Trolley wire	0.0007		
Total Investment		$ 0.0116	per ton-mile
b. Operating and maintenance labor		$ 0.0200	per ton-mile
c. Operating maintenance supplies		0.0080	per ton-mile
d. Power (estimated)		0.0019	per ton-mile
Total per ton-mile		$ 0.0415	

Present cars replaced wooden cars having a weight of 1.75 tons each and a carrying capacity of 2.75 tons of raw coal. A comparison between the old and the new shows that 4.7 small cars equal the carrying capacity of one large steel car. At this mine there were 650 of the small cars in use which had a total storage capacity of 1625 tons. These were replaced with 175 13-ton steel cars which have a storage capacity of 2275 tons. The dead load weight of 4.7 small cars is slightly over eight tons while the dead load weight of the equivalent one steel car is 4.5 tons. This indicates a calculated power reduction of more than 45 per cent for main line haulage. The wooden cars cost $450.00—$6.82 per cu ft or $164.00 per ton of capacity as compared to the steel car cost of $3.29 per cu ft and $100.00 per ton of capacity.



What was once good practice is now obsolete

Operated first as an open pit the Preachers' Kids Mine is now an underground operation

The Preachers' Kids Mine

Small Miners Build Tungsten Property from Scratch

By I. & P. KIRKPATRICK
Julian, Calif.

ON the Mexican Border at Jacumba, Calif., 75 miles east of San Diego, a promising tungsten deposit is being mined in the northern Sierra de Juarez Mountain Range. Ore is hauled from the mine perched on top a 4500-ft promentory, down a winding, three-mile, one-way dirt road through barren, wild mountains covered with huge boulders and rocks that appear to have been pyramided there by some giant.

In 1951, when the Korean crisis brought about the creation of the Defense Production Administration, and within its structure, the Defense Materials Procurement Agency, with encouragement for domestic mining, Pete Clark, long-time prospector and miner, turned his ultraviolet light on what appeared to be an excellent deposit of scheelite. The location was under claim as a gold prospect. Negotiations were begun by a close friend of Pete's, who succeeded in obtaining a lease on the property. When his efforts to finance mining operations failed, Pete and his brother Primus took over the lease and immediately set to work in August 1952. The two men, working alone, blasted and dug, hand-picked the ore and accumulated a truck load ready for milling.

At this point they encountered their first and greatest difficulty of the venture. There was no road passable by truck to within loading distance of the diggings. Over three miles of boulders separated them from the nearest highway. They had been travelling in about three-quarters of the way to the mining operations by Jeep, over a trail used by the United States Border Patrol to protect the boundary line between Mexico's Baja California and this country during the Mexican Hoof and Mouth Disease epidemic. From that point, the Clarks scrambled to the top by leg power, carrying with them their equipment. Primus, who lost a leg years ago when a defective stick of dynamite exploded while he prepared to blast a well for a neighbor, broke his artificial leg one afternoon while on his way up to the mine and had to crawl the remainer of the distance, clawing his way upward.

With their first load piled ready for hauling, the brothers set themselves to build a road. By hand and with the simplest of tools, they constructed a dirt road that would bring a truck almost to the top. They rigged a chain pulley from that point and hauled a small trailer to the top, loaded it and let it down, repeated the process until they had the first truck-load of ore ready to go. Pete took the truck down the steep, winding road, out to Highway 80 and on to Quartzite, Ariz., for milling.

Build Own Mill

Some months later they contracted with Sun Valley, California, to mill and separate their ore magnetically. The difference between cost of hauling to Quartzite and the cost to Sun Valley was helpful, but hauling and milling charges together were heavy. The Clark Brothers began to cast

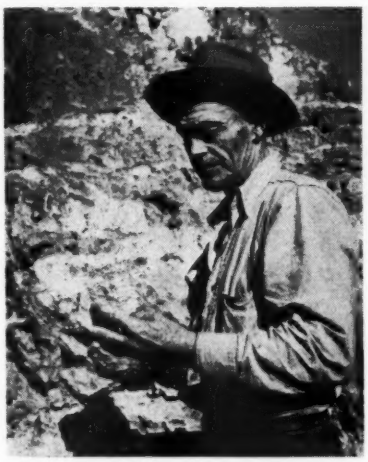
about for a way to build their own mill.

At this time Paul Henderson, a real estate broker from La Mesa, Calif., and a former music teacher, came into the picture. Knowing nothing about mining, but with faith in the two brothers and their discovery, he threw in his lot with them.

They decided to build a mill, selecting a location just east of the center of Jacumba on Highway 80. Piece by piece the equipment was installed and little by little improvements have been made until now they are equipped to handle 45 to 50 tpd of ore, on a 24-hour basis. They plan to mill on a custom basis soon.

Add to Staff

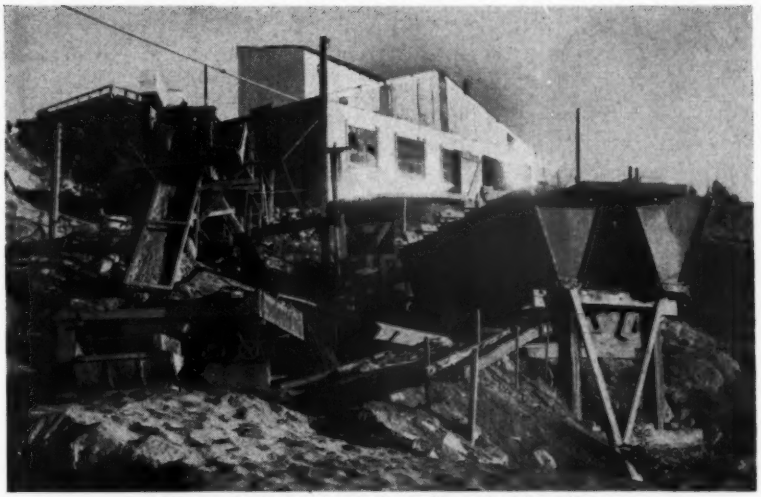
Their first discovery was mined as an open pit. As work proceeded, with additional development work and three employes added to the staff,



Pete Clark learned prospecting and mining from his father

more veins have been uncovered and several have been worked. Present operations consist of horizontal tunneling. A Joy Leg Drill is used; an ample supply of water comes from a well dug on the claim. Very little timbering has been necessary, since the rock formation is extremely hard. A small dump car on rails carries the ore to a dump within the tunnel. Here it is hand sorted under the ultra-violet light; then loaded on the truck and hauled to the mill, where it is crushed, screened and washed.

Since tungsten minerals have high specific gravities, they are readily concentrated by jigs and tables. This mill is equipped with a Denver type jig, a Straub Ball Mill—3 by 4-ft with a screen-end discharge of 10 mesh. There are two Deister Gravity Tables, one for minus 18 mesh rock, the other for plus 18. Trommel screens are used. The mill needs a staff of six or seven persons when



Partners built 50-tpd mill themselves piece by piece

operating at capacity, and full scale operation at the mine requires five or six men.

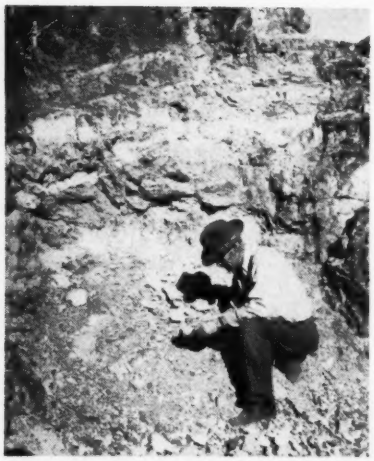
After milling, the ore is hauled to Sun Valley for magnetic separation. The partners plan to install their own magnetic separator in the near future, to give them a complete operation. They will thus be able to meet government requirements of a 60 percent concentrate and comply also with the limit set as to the amount of other minerals in the concentrate. A penalty is imposed on suppliers whose ore does not meet this second requirement. Considerable garnet is extracted in magnetic separation and the concentrate will frequently run 73 percent and over after this process.

From Sun Valley the tungsten concentrate is shipped to San Francisco and to government stock piles.

Pick a Name

The time arrived when Pete and his partners felt that it was proper and fitting to give their undertaking a name. They gave considerable thought and discussion to its selection. Possibilities were many. In itself the location of the mine and the mill offered several. The fantastic, boulder strewn territory, the view due east of California's fabulous Imperial Valley across a drop some 35 miles distant to below sea level, the closeness to the Mexican border—both

Preachers' Kids Mine lies in the northern Sierra de Juarez Mountains close to the Mexican Border



Prospector Clark found what looked like a promising scheelite deposit

mine and mill are within fifty yards of the barbed wire fence separating the United States of America and the United States of Mexico, and Jacumba with its health giving sulphur springs, all presented ideas for characteristic and appropriate titles.

But in getting-acquainted sessions around Pete's oilcloth covered kitchen table in the shack he built just below the mine, the three men found they had one thing in common—they were all the sons of Methodist ministers—"preachers' kids." What's more, Pete and Primus had been introduced to prospecting and mining by their preacher father.

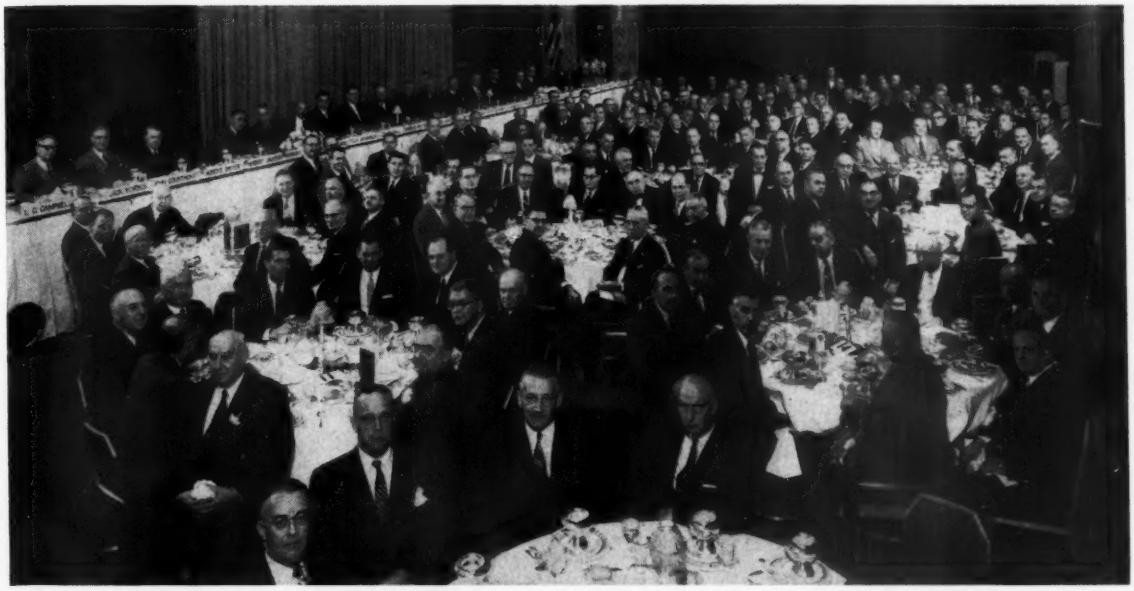
Way back in 1911, Dad Clark, who had held pastorates in the south and middle west for many years, was advised by his doctor that he had an advanced case of tuberculosis and had, at the most, two months to live. He refused to accept this diagnosis and came west to California. Once again doctors told him he was a dying man. "But he was stubborn," says Pete, "always was. Got his hands on a team of burros, a covered wagon and some horses and took us all to live in the mountains of Southern California." He became interested in prospecting—and lived to the age of 91½ years, 41 more than had been allotted to him by medical science.

With this combined background of the three partners, what could be more appropriate than to designate their mutual undertaking "The Preachers' Kids Mine"? With the addition of the mill, the title was expanded to "The P-K Mining and Milling Company."

Each of the three partners complements the other two. Henderson, the successful real estate broker, is competent and capable of handling administrative details, and does. Primus Clark has been an automobile mechanic, an aircraft worker, and has had milling experience; he is in charge of milling operations. Pete directs the mine. Early in life he shared his Dad's interest in prospecting, and although he interspersed a lifetime of mining and prospecting with cowpunching, cooking for camps, and even dish-washing when times got hard, he never lost his first interest. He has several finds to his credit, but none so important as the P-K tungsten claim.

The P-K operation may be comparatively small, unique possibly only in its location and the fact that it was the first to be developed in San Diego County, nevertheless it shares in contributing to the maintenance and betterment of our national security and peacetime industrial development. Tungsten is of sufficient importance to the U. S. Government for it to offer a domestic subsidy of $63 a short ton, as against a world price of $27, in an effort to stimulate its mining here. Of the $2,500,000 worth of tungsten being purchased each month by the government, the P-K mine may not supply a great amount, but as industry knows, it is not infrequently that a big company starts with the prospector claimholder and small miner.

Ore is trammed in dump car to a dump in the main adit where it is hand sorted under ultra-violet light before shipment to mill



After dinner the Honorable Dewey Short, U. S. Representative from Missouri, addressed the members

Annual Business Meeting

New York Meeting Brings Members from Every Part of the Nation

ROUNDING out the 56th year of the American Mining Congress, representatives of member companies from the coal industry, from metal mining and from the industrial minerals field gathered in New York on November 29 for their annual dinner and business meeting at the Waldorf-Astoria Hotel.

AMC President Howard I. Young presided over the meeting.

Julian D. Conover, executive vice-president, reported on the activities of the American Mining Congress during 1954 both in matters of legislation and Government policy affecting the mining industry and in furthering the technical progress of the industry, and discussed the problems which will require particular attention during 1955.

Speaking of the Mining Show in San Francisco last September and the Coal Show to be held in Cleveland next May he pointed out the community of interest shared by all branches of the mining industry, and stressed the advantages to be gained by attendance at the Coal Show not only by coal mining men but also by those whose primary interests lie in the metal or industrial minerals fields.

Conover gave special recognition to the chairmen of the standing committees of the Mining Congress and emphasized the importance and effectiveness of their work on behalf of the entire mining industry. Among the chairmen present were: Henry B. Fernald, chairman of the Tax Committee; Finance Committee Chairman Andrew Fletcher and former chairman of that committee as well as Pension Committee Chairman Erle Daveler; Ralph Gottshall, chairman of the Manufacturers' Division; Richard Klugescheid, vice-chairman of the Land and Water Use Committee; Chairman John Courtright of the Committee on Materials for Mining Equipment; Sam Williston, chairman of the Strategic Minerals Committee; Don MacBride, chairman of the Cement Advisory Committee, and the National Program Committee Chairmen for the Coal Convention in Cincinnati and the Mining Show in San Francisco last year, Edward Fox and Frank Milliken, respectively.

Following an outline of Washington matters of concern to the minerals industries, Conover summed up by urging the members to call on the staff whenever and wherever they might think it helpful, and pointed out that in view of the strenuous year ahead they should hold themselves in readiness "to get behind the things that need doing so that we can have a strong, expanding and prosperous mining industry in this country."

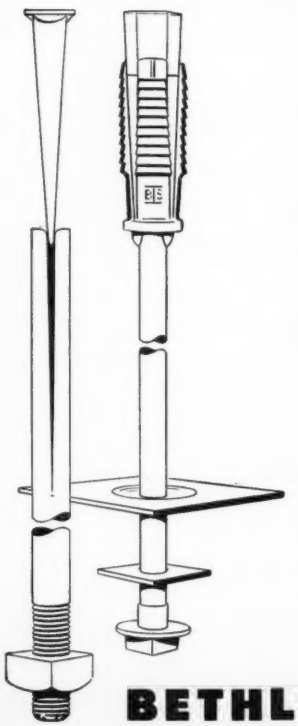
Andrew Fletcher, chairman of the Finance Committee, reported that the American Mining Congress is in a sound financial position and said that the enrollment of further mining company members is expected during the year ahead.

President Young expressed thanks to all AMC committees, especially to the Tax Committee for its fine work in connection with the new Internal Revenue Code and the Labor Relations Committee which has been active in seeking a well-balanced code of labor law. He then introduced these distinguished guests: Assistant Secretary of Interior Felix E. Wormser; William G. Wrather, Director of the U. S. Geological Survey; John J. Forbes, Director of the U. S. Bureau of Mines and former Senator Albert Hawkes of New Jersey.

The following were elected to the AMC Board of Directors for a three-year term: Horace M. Albright, president, United States Potash Co.; Joel M. Bowlby, president, Eagle Picher Co.; Worthen M. Bradley, president, Bradley Mining Co.; Charles R. Cox, president, Kennecott Copper Corp.; R. T. Elstad, president, Oliver Iron Mining Division, U. S. Steel Co.; Carroll A. Garner, vice-president, Jeddo-Highland Coal Co.; George H. Love, president, Pittsburgh Consolidation

(Continued on page 68)

Roof Bolting Makes a Better Mine



You make any mine better, safer, more productive, when you put in roof bolts to replace old-fashioned roof supports. This is because roof bolts consolidate strata into a single-unit thick beam.

Besides promoting safety, roof bolts also help to increase production, because they make possible wider openings and clearances, and increased room in which to operate mechanized equipment. And because of the absence of space-consuming supports, ventilation is improved.

Described here are four Bethlehem roof bolts, any one of which will help you obtain these safer operating conditions.

SQUARE-HEAD BOLTS

Made in three types: (1) a ¾ in. carbon-type bolt having minimum breaking load of 20,000 lb; (2) a ⅝ in. high-strength bolt, having same breaking load, and (3) a ⅞ in. high-strength bolt with minimum breaking load of 40,000 lb. The ⅞ in. bolt is intended for use with Bethlehem's matching-halves Type F expansion shell. The ¾ in. and ⅝ in. bolts may be used either with the Type F shell or the 4-leaf Type C shell.

For use with headed bolts, Bethlehem also makes a hardened washer. It reduces the friction between the bolt head and the roof plate that occurs when high tension in the bolt produces excessive bearing pressure. The washer permits the free use of impact wrenches, without galling or tearing of metal.

SLOTTED BOLT

A 1-in. bolt, with a centered, forged slot. No metal is removed in slotting. Opposite end of bolt has 5 in. of rolled threads. Bolt is for use with steel wedge, in 1¼ in. hole. When bolt is driven, wedge is forced into slot, expanding bolt-end. Truncated-cone point prevents thread damage. Usually comes with American Standard regular square nut.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM MINE ROOF BOLTS

BETHLEHEM STEEL

Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

THE first session of the 84th Congress has convened with control of both Senate and House shifting from the Republicans to the Democrats. In the House Rep. Sam Rayburn (Dem., Tex.) has taken over as Speaker from Rep. Joe Martin (Rep., Mass.), while in the Senate the majority leader is now Senator Lyndon Johnson (Dem., Tex.), who replaces Senator William Knowland (Rep., Calif.).

Shift of control in Congress poses many legislative obstacles for the President. While the new leadership has promised to cooperate on such matters as foreign policy, foreign economic aid, and mutual security, there is little likelihood that there will be such "sweetness and light" on domestic economic matters. Most observers, even now, are wondering how long the honeymoon will last with respect to foreign policies. All members of Congress will study the proposals presented for consideration with a view to their effect upon the 1956 elections, and for this reason it is felt that the legislative mill will not grind out too many laws of national import.

The President has taken the initiative in seeking conferences with the leaders of both parties on his legislative proposals, and has directed his Cabinet to confer with Senate and House Committees before they propose any plans in the field of foreign affairs and national defense. Whether these relationships with Congress will remain smooth in the months ahead remains to be seen.

Trade Act Changes

Top priority is likely to be given at this session of Congress to Presidential recommendations for changes in the Trade Agreements Act. Clarence B. Randall, head of the Commission which developed proposals for further slashing U. S. tariffs and for broadening world trade, has said that the President's tariff program will be considered in a "much more friendly" atmosphere. He predicted that approval is likely to be given to a three-year extension of the Act, and that the President will be authorized to make selective decreases in tariffs up to 5 per cent a year for a period of three years.

Extension and liberalization of the Trade Agreements Act will not go unchallenged in either house of Congress. Many measures are already being prepared for introduction which would set up safeguards for domestic industries. Thus, Senator Price Daniel (Dem., Tex.) has already announced that he will introduce legislation to limit oil imports, and several House members plan to do likewise. Measures to provide some form of protection for domestic lead and zinc producers are also to be thrown into the hopper.

Most observers feel that a three-year extension of the Act is a good bet, but there is a wide diversity of opinion as to the possibility of writing into the Act some provisions that will aid domestic industries suffering from excessive imports.

Meanwhile, the Tariff Commission this month will hold public hearings under provisions of the Antidumping Act, to determine whether or not muriate of potash from the Soviet section of Germany is being sold in the U. S. market at less than its fair value.

Tax Cut Delayed

President Eisenhower will call upon the new Congress to postpone for one year reductions in corporate and excise taxes that are scheduled to go into effect on April 1.

The President said that the Government cannot afford to pare these taxes because it is again faced with a budget deficit in the fiscal year which begins July 1. The scheduled tax reductions would result in a loss of revenue totaling $2.9 billion. While the President did not indicate the size of the expected 1956 deficit, Treasury officials estimated that it would run about $3 billion even if the tax reductions are postponed. They also said that tax receipts will total between $59 and $60 billion in the next fiscal year if the cuts are not put into effect. Expected outlay for the next fiscal year is estimated between $62 and $63 billion.

Sentiment on Capitol Hill leans toward retention of the present corporate rate but there may be moves made to lower some of the excise rates.

Meanwhile, the Treasury Department continues its efforts to complete the regulations under the Revenue Code revision enacted at the last Congress.

T-H Revision Doubtful

Prevailing view in the Nation's Capitol today is that there is virtually no chance of Congressional action on Administration proposals to revise the Taft-Hartley Act. While the President is likely to renew his request for at least some of the recommendations he made last year, key legislators of both Houses have expressed the opinion that this request will go unheeded.

During the last Congress, the House Labor Committee did not even report a labor law revision measure to the floor, while in the Senate the President's 14 recommended changes were placed in the deep freeze when the upper chamber recommitted a revision bill to its Labor Committee.

Washington Highlights

TRADE ACT: Gets top priority.

TAX CUTS: To be delayed.

T-H REVISION: Doubtful.

MINING LAWS: Changes to be sought.

MINERAL-COAL POLICIES: On the way.

COAL WAGE: Minimum rate proposed.

POLLUTION: Studies urged.

Meanwhile, Labor Secretary James P. Mitchell has churned up a mild tempest within the Administration and among labor unions by blasting State right-to-work laws during an address before the CIO annual convention. Mitchell said that the 17 State laws banning compulsory unionism "do more harm than good," and went on to declare, "I oppose such laws categorically." He told the union that such laws restrict union security and "thereby undermine the basic strength of labor organizations." His remarks were interpreted as representing the views of the President but this interpretation was not of long duration. The day following his talk, the President indicated in no uncertain language that Mitchell was not speaking for him. Mr. Eisenhower, in a later news conference, reiterated that Mitchell's statement was Mitchell's alone, and that the President had no present opinion on the subject and would not make one until the matter was thoroughly considered.

Mr. Eisenhower made it crystal clear that he alone will decide Administration labor policy, even though he will look to his Cabinet members, including Secretary Mitchell, for advice.

Mining Law Changes

Interior Secretary Douglas McKay has reiterated his support for amendments to the mining laws which would eliminate abuses and still maintain the basic principles of those laws and thus encourage the large investments necessary if we are to have an efficient "going-concern mining industry."

In an address before a western forestry meeting, McKay said that the Interior Department actively supports legislation which would make it impossible to locate mining claims for common materials, such as sand stone, and gravel. He said adoption of such a law would largely eliminate the locating of claims for the main purpose of acquiring summer home sites or tracts of valuable timber. Speaking of timber on mining claims, McKay said that the Interior Department has supported, and will continue to do so, legislation which would make it possible for the United States to cut and remove merchantable saw timber from unpatented mining claims. He pointed out that this would discourage the filing on a marginal mineral claim just to acquire timber, and even if the mineral discovery were valuable, the United States could sell the merchantable timber at any time prior to the issuance of patent. He emphasized that after patent the surface rights including timber would not be reserved to the United States, thus giving the mining industry the security of title intended by the mining laws.

McKay also declared that his Department and the Agriculture Department are currently reappraising the Federal public land policy with a view to returning public lands to State or local governments or to private citizens, and to eliminating unnecessary reservations of public lands.

It is highly likely that changes in the mining laws will be an active subject in the current Congress. It is understood that bills have already been prepared for prompt introduction which would be similar to the D'Ewart-Dworshak and Regan measures of last year. These measures will be aimed at curbing abuses of the mining laws without disturbing the basic principles of those laws. However, other measures will be introduced calling for drastic changes in the laws, such as separation of the surface from the mineral rights and reservation to the Government of all timber on a mining claim even after patent.

At the last session of Congress, a House Judiciary subcommittee reviewed Title 16 of the U. S. Code which deals with conservation and reclamation including the national forests, with a view to codifying the various laws on these subjects.

Although it was not the Committee's intention to make any substantive changes in the basic laws affecting these matters, the final draft of the bill and a report thereon did make certain drastic changes in the general mining laws which would largely bring mining in national forest to a halt. Those working on the draft had taken the language of a few isolated laws pertaining to small areas of specific national forests and made them apply generally.

This was immediately called to the attention of the Committee by the American Mining Congress, and a request made that any substantive changes in the mining laws be the subject of full hearings before the House Interior Committee before being considered by the House. As a result of this protest and those of various Government Departments and agencies which were affected by other substantive changes, the committee is expected to revise its draft and confine it strictly to codifying the laws. Chairman Clair Engle (Dem., Calif.) of the House Interior Committee has asked the Judiciary Committee to refer any proposed changes in the mining laws, or other laws dealing with matters subject to consideration by the Interior Committee, to that group.

Minerals-Fuels Policies

The 11-point national minerals policy recommended by the Cabinet Committee has been approved by the President but remains to be implemented. The policy statement called for review of stockpile objectives, establishment of mobilization base levels for minerals and metals, mobilization planning for mineral output, elimination of tax deterrents to mining, financial assistance for exploration, increased topographic and geological mapping, revision of mining laws to encourage mineral development, strengthening of mineral statistics collection and evaluation, increased mineral research, and establishment of industry committees to advise the Government on policies.

It is expected that some machinery will be set up within the Interior Department for the implementing of these policies on a "case-by-case" basis, and that industry advisory groups may be named to aid the Department in arriving at means of carrying them out.

Meanwhile, the special Cabinet Committee report on fuel supplies and energy resources will be considered early this month by the full Cabinet. Preliminary meetings of the Committee, comprised of the Secretaries of State, Defense, Interior, Commerce, Labor, the Attorney General and the ODM Director, have been held to discuss recommendations of task force groups setting forth broad policy recommendations affecting coal, oil and natural gas.

Coal Minimum Wage

Labor Secretary James Mitchell has received a request from the United Mine Workers and two major coal producers to establish an $18.25 per day minimum wage for bituminous coal miners working on Government contracts.

Mitchell has the authority to set minimum wages for Government contractors under provisions of the Walsh-Healey Public Contracts Act. He told reporters that he would take prompt action on the request.

The minimum wage request was made by President John L. Lewis of the UMWA; George H. Love, president, Pittsburgh Consolidation Coal Co., and A. R. Matthews, president, Pocahontas Fuel Co. It is understood that this action was sought because substantial Federal coal purchases, particularly for the Tennessee Valley Authority, are being made from producers paying wages far below union scales.

The minimum sought is the basic day rate under the UMWA contract with signatory operators. In the event the Labor Department establishes the $18.25 rate as the minimum "prevailing wage," it would apply only to companies holding Government contracts. Before such a rate can be established public hearings must be held. Any minimum wage rate set by Labor Department will be subject to court review.

Pollution Under Study

At a recent conference of State and Territorial health officers, Secretary Oveta Culp Hobby of the Department of Health, Education and Welfare de-

(Continued on page 68)

Coal Convention and Exposition

Cleveland, Ohio, May 16-19

AS THE Coal Industry swings into 1955 on a note of optimism, all eyes are turned toward Cleveland where the American Mining Congress Coal Show will be held in the Public Auditorium, May 16-19.

Thousands of mining men and ladies from coal regions all over the country are planning to be there. This year, as in the past, many representatives from the metal and industrial minerals mining industries will also be on hand. They have found, as coal miners already know, that a few days spent in the meeting rooms and exposition halls pay off, giving them more information and new ideas than could be acquired in several weeks spent in visiting other properties.

The Exposition will include everything relating to the mining and preparation of coal. Exhibits will show machines and equipment for deep and strip mining as well as for preparation plants, shops and power systems. Visitors whose primary interests are outside the coal industry will find that almost all of the equipment displayed here has application in their own fields as well.

Coming at a time when it is more important than ever to get maximum output from both men and machines, the Convention will point the way to safer mining, more efficient operation and the preparation of a higher quality product. A glance at the outline of the convention sessions will show that the importance of coal to our national economy and the absolute necessity for maximum efficiency and safety within the industry itself were in the minds of the Program Committee when it chose the topics for discussion at this meeting.

All mining men and exhibiting manufacturers will be given an opportunity, well before meeting time, to send in lists of the representatives they expect to send—who will then be furnished with advance registration cards. The Coal Show presents an unparalleled opportunity to educate both top management, and also the operating and maintenance men, in the latest methods and equipment. Active participation in the sessions plus careful study of the exhibits will yield rich returns. Most mining companies recognize this and send just as many key men as possible to Cleveland.

With another capacity crowd expected at the 1955 Show—all accommodations will be handled through the Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13. Requests for reservations should be sent in promptly.

Outline of Convention Sessions

MONDAY MORNING, MAY 16

Continuous Mining

Basic Requirements for Successful Continuous Mining
Continuous Mining in (a) Low Coal and (b) High Coal
Maintenance of Continuous Mining Equipment

MONDAY AFTERNOON

No Sessions

TUESDAY MORNING, MAY 17

Mechanical Mining Session

Mine Maintenance—(a) Organization, (b) Cost Accounting
Mechanical Mining in Thin Seams
Mechanical Mining in Thick Seams
Mechanical Mining in Pitching Seams

Roof Support Session

Latest in Mine Roof Bolting
Full and Partial Pillar Extraction
Strata Control in Pillar Mining

TUESDAY AFTERNOON

Strip Mining Session

Two-Seam Stripping and Overland Belt Haulage
The Truax-Traer Wheel Excavator
Improvements Needed in Present Truck Designs—A Symposium

WEDNESDAY MORNING, MAY 18

Haulage and Power Session

Considerations in Designing a Mine Haulage System
Underground Haulage (a) Shuttles, (b) Conveyors, (c) Mine Cars
Comparison of AC and DC for Underground Mining

Management Session

Coal in Relation to National Defense
Supervisory Training
Industrial Engineering

WEDNESDAY AFTERNOON

Strip Mining Session

New Drilling Developments—Anthracite and Bituminous
The Akremite Blasting Process
Correlated Strip, Auger and Deep Mining—A Symposium

THURSDAY MORNING, MAY 19

Coal Preparation Session

Fine Coal Preparation in Conjunction with Coarse Coal
Complete Preparation of Fine Coal with Jigs to Filter
Preparation with Jigs or Launders in Tandem with Tables
Dewatering and Drying Fine Coal

Continuous Mining Session

Recent Developments in Service Haulage
Roof Support for Continuous Mining
AC Power in Continuous Mining

THURSDAY AFTERNOON

Safety Session

A Panel Discussion by the U. S. Bureau of Mines, State Inspection Departments and Coal Operators

AMC Personals

Henry P. Early, chief engineer of the Magna mill's central power plant, Utah Copper Division, Kennecott Copper Corp., retired December 1. He was replaced by **John H. Harkins**, assistant chief engineer.

Robert M. von Storch has been appointed superintendent-Coal Mines and Quarries, Columbia-Geneva Steel Division, U. S. Steel Corp. He succeeds **Frank V. Hicks**, who retired November 30.

R. M. von Storch

James Cassano succeeds von Storch as superintendent of the Division's Columbia coal mine located near Dragerton, Utah.

Von Storch was superintendent of the Loree Division of the Hudson Coal Co. before he came to Utah as superintendent of the Columbia mine for U. S. Steel.

E. R. Lovell, president of Calumet & Hecla, Inc., announced November 29 that the company has offered to buy the property of its subsidiary, the Cliff Mining Co. Lovell said a shareholders' meeting of the Cliff Mining Co. will be called to act on the offer.

Marvin E. Hall, former federal mine inspector, was recently appointed superintendent of Glogora Coal Co. Blue Pennant mines in Boone County, W. Va. Hall resigned his position as inspector with U. S. Bureau of Mines August 1. He suceeds the late Frank Hughes.

Dr. Phillip L. Merritt has joined the staff of the E. J. Longyear Co. as senior geologist. In his new capacity he will work out of the new consulting offices the company has established in the Graybar Building in New York City.

Until recently Merritt was assistant director for exploration, Raw Materials Division of the U. S. Atomic Energy Commission. His connection with the commission dates back to the days when as a major in the U. S. Army Engineering Corps he was responsible for the procurement of raw materials for the Manhattan Engineering District. This was the predecessor of the Atomic Energy Commission, charged with the development and use of fissionable materials.

Herbert M. Leppich has been appointed director of the division of engineering and construction, Idaho operations, Atomic Energy Commission, according to **Allan C. Johnson**, manager. Leppich fills a vacancy created when Johnson, former director of the division, was advanced to manager of the Idaho operations office.

Dr. R. H. Crist will be in charge of the Coal Hydrogenation projects at Charleston and Institute, W. Va., as manager of the Physical Processes Department, Carbide and Carbon Chemicals Co., a Division of Union Carbide and Carbon Corp., according to an announcement made by Dr. George T. Felbeck, vice-president of the company.

J. G. Huseby, until recently assistant general manager of the Mountain Copper Co., Ltd., in California, has resigned his position there after 25 years to open consulting offices at 777 Euclid Ave., Berkeley 8, Calif. During the course of his employment at Mountain Copper he has been in charge of open pit and underground mining operations, cyanide and flotation plants; has supervised project and process evaluation work as well as construction. He has also directed major research projects.

Richard A. Mullins has been named preparation manager of the Enos Coal Mining Co. at Oakland City, Ind., to succeed the late Wm. Caler. He will also be preparation manager for Enoco Collieries, Inc. at Vincennes, Ind. Mullins was formally chief chemist for the Ayrshire Collieries Corp. at Danville, Ill.

Joseph C. Schumacher, until recently vice-president and director of research of Western Electrochemical Co., has joined American Potash & Chemical Corp. as director of research.

In his new capacity, Schumacher will direct all research activities of the company and its subsidiaries under D. S. Dinsmoor, vice-president in charge of research and development.

Schumacher will continue as a director of Western Electrochemical Co., located at Henderson, Nev., in which American Potash & Chemical Corp. has a substantial interest.

Dr. A. F. Banfield and **Roland F. Parks** of Behre Dolbear & Co. have been in Labrador doing field work in connection with a valuation of iron ore deposits.

Mitchell Melich, Moab, Utah attorney, has been named chairman of the newly formed uranium committee of the Utah Mining Association.

P. H. Hutchinson, superintendent of Garfield Chemical and Manufacturing Co., has retired. His successor is **A. S. Nelsen**, formerly assistant superintendent of the firm's big sulphuric acid plant at Garfield.

Dr. Erich Sarapuu, former director of research, Sinclair Coal Co., has announced the formation of a new research company, incorporated in the state of Minnesota as Electrotherm Research Corp. Offices of the new concern are located in the Kansas City Southern Building, 114 West 11th Street, Kansas City, Mo.

The new company specializes in the electrotherm process of oil recovery from depleted fields and the underground electrocarbonization of coal.

Dooley P. Wheeler, Jr., superintendent of Western exploration for American Metal Co., Ltd., has resigned to enter business in Salt Lake City as a private consultant on mining geology.

Wheeler has worked for the U. S. Geological Survey, Cerro de Pasco Copper Corp., and Eagle Picher Mining Co. He joined American Metal in 1949.

A. V. Sproles, vice-president in charge of operations, Pocahontas Fuel Co., Pocahontas, Va., has announced the transfer of several mine supervisors.

Richard J. Baugh has been appointed superintendent of the Amonate mine. He had been assistant superintendent of the company's Itmann mine.

Howard H. Morefield, formerly general mine foreman at Itmann, was made assistant superintendent of the Amonate mine. **Grover L. Asbury**, formerly assistant superintendent at the Bishop mine was transferred to the same position at Itmann.

Climax Molybdenum Co. has announced the appointment of **John J. Curzon**, an official of the AEC at Grand Junction, Colo., as the new director of exploration and developing for the company. Curzon has been deputy director of the mining division of AEC and has a record of 31 years of mining and geological experience as well as an intimate knowledge of most mining districts in the western states, Western Canada and Alaska.

Alfred L. Hopkins has been elected treasurer of Pocahontas Fuel Co. to succeed **Adolph Butze, Jr.** Butze resigned the position he has held since 1940 and will continue in a consulting capacity until January 1955, when he will retire under the company's retirement plan.

D. W. Tittman, metallurgical engineer, St. Joseph Lead Co., Bonne Terre, Mo., is now with the Erie Mining Co., Aurora, Minn.

Ayrshire Collieries Corp. has announced that **Richard H. Swallow**, chief engineer of the Ayrshire group of companies, has been elected a vice-president of the company. His new position will be as vice-president and chief engineer.

Swallow is a graduate of the University of Wisconsin and has been with Ayrshire and its predecessor companies since 1937. He has been chief engineer since 1940, serving continuously in that position save for one leave of absence when he was with the U. S. Coal Mission to Great Britain to assist the development of open-cast mining in England.

The appointment of **Kenneth F. Farley** as assistant smelter manager of the Calumet Division, Calumet & Hecla, Inc., has been announced by vice-president and general manager A. S. Kromer. Farley has been the Division's assistant controller since 1953.

It was also announced that **Raymond J. Marcotte**, the present assistant smelter manager, will be transferred to duties involving special technical assistance to the general manager.

The election of **John McDowell**, vice-president of The Philadelphia National Bank, to the board of directors of The Philadelphia and Reading Coal and Iron Co. was announced by Edward G. Fox, president of P & R. McDowell was elected to the P & R board for the balance of the unexpired term of Evan Randolph, resigned, or until the annual meeting of shareholders on May 9, 1955.

Joseph J. Swigart has been named general manager of Vitro Rare Metals Co. of Canonsburg, Pa., division of Vitro Corp. of America, according to J. Carlton Ward, Jr., president. He replaces **Franklin H. Bivins** of New York who becomes assistant to the executive vice-president of the corporation.

T. G. Gerow, until recently president and director of the West Virginia Coal and Coke Corp., has opened consulting offices at 307 North Michigan Ave., Chicago 1. He will specialize in strip mining, planning and plant layout, coal preparation, operations and river coal loading and unloading terminals.

Theodore B. Counselman has joined the staff of Behre Dolbear and Co. of New York, consultants in mining, geology, metallurgy and management. Counselman was, until December 31, manager of the Dorr Company's Fluo-Solids Sales Division. During his 27 years with Dorr he was intimately associated with many developments in the concentration of iron ore in Minnesota, application of closed circuit grinding in the wet process cement industry and with blast furnace practice in pig-iron manufacture. Following graduation from the Columbia School of Mines Counselman worked in both mining and ore dressing in the copper mines of Arizona and Mexico. He was associated with D. C. Jackling in the initial attempt to treat the magnetic taconites of Minnesota.

— *Obituaries* —

O. T. Scollon, 62, preparation engineer for Peale, Peacock & Kerr, Inc., died unexpectedly in Barnesboro, Pa., on December 5.

Ogden A. Kantner, 43, president of the United Clay Mines Corp., Trenton, N. J., died October 10.

Mr. Kantner participated in the reorganization of the United Clay Mines Corp. in 1952 and had been president of the company since that time. He was connected with the company for some years and served successively as assistant general manager, manager, vice-president and president.

William J. Wilcox of Butte, Mont., retired chief clerk of the Anaconda Copper Mining Co., died in Missoula on September 10. He was employed by ACM for about 50 years.

George A. Schroter, 83, passed away in New York last November. He was one of the handful of oldtimers who were famous around the turn of the century and in the early 1900's.

Mr. Schroter's early experience was gained in Colorado with Rico Smelting and Refining Co. Following this he was consulting engineer in South and Central America and Russia. He was associated with John Hays Hammond in work for the Venture Co. of London, Stratton's Independence, Camp Bird in Colorado and the Esperanza in Mexico as well as the Oroville Dredging Co. in California. Among the other properties, with which he was associated in his long and eventful career, were: the Dolores, El Rayo, Creston Colorada and La Dura Mining & Milling Co. in Mexico; the San Xavier Mine in Sonora; Miami, Bagdad and other porphyry copper properties in this country.

Noted for the thoroughness and brevity of his reports, he was famous for the shortest one on record. Written on the back of an old envelope it consisted of the remark, "N.G."

The mining industry has lost one of its most colorful figures with the passing of George A. Schroter.

Oscar C. Wills, 69, vice-president of the Union Manganese Co. in Marion, Va., was fatally injured September 28, while making a routine check in the Union Manganese Mine near Marion.

Asher Graham Spillman, 93, former western Kentucky coal operator died November 14 in Madisonville, Ky. Mr. Spillman retired seven years ago as mine superintendent of the St. Bernard Coal Co. after having worked in the coal industry 46 years.

Joseph Lynn Hughett, 70, attorney and former head of a number of coal mining companies in Kentucky, died September 28 in Louisville, Ky. He had been in ill health for several years.

Born in Oeida, Tenn., Mr. Hughett came to Kentucky in 1950 to become general superintendent of a coal mining company at Daniel Boone, Ky. He was president of the Caney Creek Coal Co. from 1920 to 1931, and president of the Hickory Hill Coal Co. from 1935 to 1939.

NEWS and VIEWS

Eastern and Central states

Lake Ore Shipments Off

Vessels in the Great Lakes iron ore fleet completed their poorest year in the last 15, exclusive of the strike year of 1946, according to figures released recently by the Lake Superior Iron Ore Association.

The 1954 total on December 7, with only a few more cargoes to be transported from the Upper Lakes, stood at 60,793,687 tons. During the record breaking 1953 season, the figure was 95,844,449 tons. The last regular season in which tonnage was less than this year's was in 1939, when 45,073,000 tons of ore were shipped. In 1946, when the Great Lakes transportation system was crippled by a strike, only 59,357,000 tons were moved.

Joins Century Club

The American Coal Co., operator of mines in McComas, Widemouth and Covel, W. Va., has passed its 100th birthday. The company operates the Crane Creek Coal and Coke Co. at McComas, the Piedmont Coal and Coke Co. at Widemouth and the Deerfield Coal and Coke Co. at Covel.

Company records show that when it opened its first mines in 1854 in the famous Big Vein of the Georges Creek section of Maryland, shut-downs occurred continuously because of troubles with hostile redskins.

The company acquired the mining territory in McComas and Widemouth not long after the turn of the century, after approximately 54 years operation of the Maryland properties, which were then nearly depleted. The Deerfield mine was opened just ten years ago.

William C. Atwater and Co. purchased the firm in 1920 and became the exclusive sales agent for the coal, which was sold under the still existing "Atwater Pocahontas" trademark.

800 Miners Complete Course

On December 11, 1954, a meeting was held at the new Bluefield auditorium in Bluefield, W. Va., to honor nearly 800 employes at the Bishop mine of the Pocahontas Fuel Co. The occasion marked the completion of an 11-week accident prevention training course conducted by the U. S. Bureau of Mines in which all of the mine's employes participated. This is reported to be the largest single coal mine in the country to achieve 100 percent participation by mine employes in this training course.

The training program at Bishop Mine, Bishop, Va., was organized by William H. Bowen, safety engineer for the company, at the direction of A. V. Sproles, vice-president in charge of operations. The course lasted ten weeks with an additional week for make-up classes.

Felix E. Wormser, assistant secretary of the Interior for Mineral Resources, congratulates U. S. Bureau of Mines employes who received Distinguished Service Awards, (left to right) John S. Ball, Walter I. R. Murphy, Stephen M. Shelton, Assistant Secretary Wormser, Vernon F. Parry and Harold S. Kennedy. Richard D. Leitch, retired, received his award in absentia.

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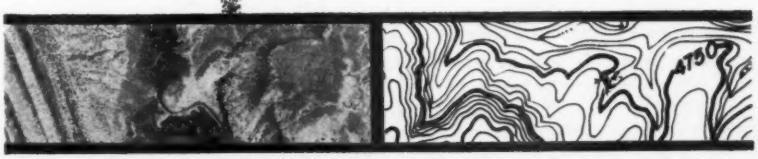

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New Brunswick Metal Find

According to N. B. Buchanan, lands and mines minister of the province of New Brunswick, what may prove to be one of the major lead-zinc-copper ore finds on the North American continent was recently discovered 32 miles northwest of Newcastle, New Brunswick, Canada.

Drilling operations on a 24-sq mi area have been going on for only four months, but three orebodies containing high grade lead-zinc-copper ore, with some gold and silver have been indicated. The ore contained in the three orebodies was drilled following airborne geophysical prospecting.

Carbon Fuel and Winifrede Merge

Directors of the Carbon Fuel Co. and Winifrede Collieries, both southern West Virginia coal producers, have voted to merge the two companies. Their action is still subject to ratification by stockholders of the respective firms.

Carbon Fuel operates three mines in the Cabin Creek section of Kanawha County, which produces more than a million tons of coal annually. Winifrede, one of the oldest mining firms in the state, operates one mine on Fields Creek in Kanawha County, which produces about 200,000 tons of coal a year.

It was explained in the announcement that the mining interests owned by Winifrede in Mingo and Fayette Counties, and in Buchanan County, Va., were not involved in the merger.

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Applications for the above awards are now invited for the academic year 1955-56. They are available to degree candidates in Mining, Mineral Engineering and Metallurgy.

The Henry Krumb Scholarships, in the amount of $1000 a year, are awarded to B.S., M.S., and professional engineering degree candidates.

The William Campbell Fellowships, with the value of $1800-2100 a year, are awarded for graduate study leading to the M.S. or doctoral degree, or for post-doctoral work.

The Kennecott Scholarship is an under-graduate scholarship, restricted to mining students, and has the value of $1000 a year.

In addition to these departmental offerings other University and Engineering School scholarships and fellowships are available to students in the School of Mines.

Application blanks and further information may be obtained from the Office of University Admissions, Columbia University, New York 27, N. Y. The closing date for applications is February 21, 1955.

Prospect Two Maine Mines

Maine Mining, Portland, Me., mining firm, has announced that it plans to embark on a program of diamond drilling on at least two of its properties in Franklin, Sullivan and Hancock Counties, Me. Surface prospecting and sampling has been completed and drilling was slated to start in late November.

Surface samples from all workings on the property showed an encouraging amount of silver, zinc and lead. These values, together with geological factors in the area, the company believed warranted immediate underground exploration to determine whether commercial operations are possible.

AEC Plans Treatment Plants

The Atomic Energy Commission has announced it is planning to spend a total of $67,000,000 for production and processing plants. A new feed materials plant will be built on a portion of the government-owned Weldon Springs Ordnance Works, 27 miles west of St. Louis, Mo. This plant will extract and purify uranium from uranium-bearing ores and concentrates from domestic and foreign sources. The new plant will be operated by Mallinkrodt Chemical Works, St. Louis.

In addition to this plant, the program calls for expansion of the following: The feed materials production center at Fernald, Ohio; feed materials facilities at St. Louis and the feed plant at the Paducah, Ky., gaseous diffusion plant. AEC said the function of the St. Louis and Fernald installations is to convert high grade uranium ore and concentrates into pure uranium compounds or metals. Paducah facilities will increase the capacity for converting uranium into forms useful to its program, the commission said.

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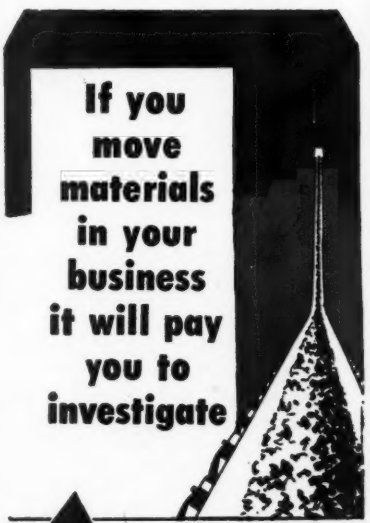

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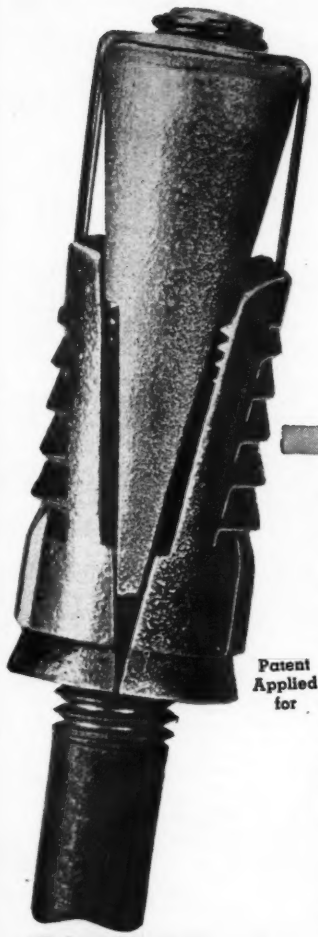

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Utility Buys Monongalia Coal

Pittsburgh Consolidation Coal Co. recently announced that under a new 15-year contract its Monongalia County mines will supply coal to the Ohio Valley Electric Corp.

Christopher Coal Co. will produce the coal which is already being mined and shipped under the contract at the rate of 21,000 tons a month to Ohio Valley's new steam-electric generating plant now under construction on the Ohio river near Gallipolis, Ohio.

According to Charles R. Nailler, president of Christopher Coal Co., the contract calls for a rate of supply of about 1,500,000 tons a year by February 1956.

Invents Mining Machine

A. G. Wilcox, president of Wilcox Coal Co., which operates in the Shady Springs District, W. Va., has invented a new type of continuous mining machine. Called the "Wilcox Miner," the machine's size and design give it flexibility to "dodge" bone or rock partings in many of the low coal seams of the area, giving a cleaner run-of-mine product.

The machine operates on the principle of a cutting machine in ripping coal from the face. Two jack pipes are set in place as anchors for the cables that pull the machine across the face after it has been sumped into the coal. It consists principally of two cutting heads, an auger to carry coal away from the head, a chain conveyor to move the coal from the face and motors to power the different parts. The cutting head is circular with bits mounted on its perimeter and one row of bits diagonally across the face.

So far, a test model of the machine has been thoroughly tried out in the company's mine. First production machine was completed early last month and was put into service immediately.

Sunday Creek Moves

Sunday Creek Coal Co., Columbus, Ohio, has recently moved into new executive headquarters at 875 East Broad Street, joining the thousands of companies who are moving to outlying districts of cities.

The firm formerly occupied offices on the ninth floor of the Outlook Building in downtown Columbus, having been tenants there since the building was first erected in 1900.

Sunday Creek distributes coal to retail, industrial and other big users throughout the Ohio-Indiana-Michigan area.

RECONSTRUCTION FINANCE CORPORATION SEALED BID SALE

Invitation to Bid for Mineral Rights and Real Estate

Approximately 17,400 acres of mineral rights in Edmonson, Grayson, Hardin and Breckinridge Counties, Kentucky; also 459 acres, more or less, of farm land in Edmonson County, Kentucky.

Reconstruction Finance Corporation invites bids for the purchase of mineral rights and real estate formerly owned by Ohio Valley Rock Asphalt Company referred to above. The mineral rights are under land located in the asphalt producing region of Kentucky and include coal, crude petroleum, oil, gas, limestone, sandstone, asphalt and any and all other materials of any kind and character except uranium, thorium and materials essential to the production of fissionable material. The 459-acre farm tract is located on State Highway 67, approximately six (6) miles from Brownsville, Kentucky, which is 100 miles south of Louisville.

Anyone interested in the purchase of the property and mineral rights may obtain bidding forms and a statement of terms and conditions relating thereto at the Chicago office of RFC, Room 221, 105 West Adams Street, Chicago 3, Illinois. Telephone: State 2-0800.

Bids for the property will be considered only if made in accordance with and subject to the terms and conditions set forth in said statement. All bids must be presented at the aforesaid Chicago office of RFC by 2:00 P. M. (C.S.T.) on February 24, 1955.

Pima Ore Body

(Continued from page 30)

of the higher grade shoots within the ore zone. Indications are that minor fault structures are a main point of control; however, as yet no definite pattern has been worked out.

Both the footwall and the hanging wall of the ore zone are assay cut-offs rather than structural cut-offs. There is everywhere a gradual decrease in copper content in the rocks extending away from the high grade ore zone. The high grade ore zone as outlined on the geological maps is the result of using a cut-off of 2.5 percent copper. This results in an average grade of 4.5 percent over the whole zone.

On the 300 level the ore extends over a strike length of 570 ft and will average 18 ft wide. The strike length on the 400 level is 790 ft and will average 42 ft in width. On the 500 level the average width is 54 ft; however, the strike length is reduced to 600 ft. Exploration has been limited on the 600 level and little is known of the ore zone to the east of the main cross-cut. To the west the strike length is 26 ft and the average width is 31 ft.

Low-Grade Exploration

Since nearly everywhere the copper mineralization graded out from the high grade ore zone, the question naturally arose as to the extent of this low grade mineralization. For the past seven months, an exploration project has been in progress to determine the extent and grade of the mineralization. This project has consisted of systematic underground diamond drilling of flat holes normal to the trend. These holes have explored an area extending 100 to 300 ft on each side of the main ore zone and for the entire length of the underground development. Eastward development has been extended on the 300, 400 and 500 levels and diamond drilling was continued along extended drifts. During the same period, a surface churn drilling project of approximately 5000 ft has been completed. Five churn drill holes have been drilled along section L-L^1 as shown on the geological maps. One hole has been drilled 400 ft east of this section and two have been drilled west of it into the arkosic quartzite in the hanging wall.

The low grade project is still in progress, and although conclusions are not yet final, results have been most encouraging. In the limestone-dolomite series, considerable low grade ore over 1½ percent copper has been delineated. In the eastern part of the mine, the arkosic quartzite which overlies the limestone-dolomite series appears to be uniformly mineralized with copper averaging more than 0.5 percent. The breccia zone and the quartzite underlying it appears also to be mineralized to about the same extent.

Thinking in relation to the economic potential of the mine has changed several times since the initial stages. First, it seemed to be a small, rather high grade property; next, a larger, medium grade property; now, the possibility exists that the Pima Mine may become a medium-large, low grade property with considerably increased economic potential.

Acknowledgments

The initial phases of the Pima exploration project, including the geological and geophysical work, were carried out by the author and Walter E. Heinrichs, Jr., Exploration Engineer for Pima Mining Co., under the direction of M. G. Edwards, Consultant for United Geophysical Co., Inc. Following the first diamond drilling, the project has been under the direction of E. D. Spaulding, General Manager of Pima Mining Co. The author wishes to express his appreciation to Spaulding for his generous help in preparation of this paper.

Much of the geological information presented is the result of the work of Milton Hood and Wayne Wallace, both geologists for Pima Mining Co.

Contributions along the lines of guidance and interpretation from Ira B. Joralemon, consultant for Pima Mining Co., have been invaluable.

USBM Regional Offices

Interior Secretary Douglas McKay has announced sites for five U. S. Bureau of Mines regional headquarters. They will replace the present setup of nine regions. The changeover will take place about January 1, on the completion of reorganization of the Bureau, Mr. McKay said.

The new regional headquarters and the states they will cover are:

Albany, Ore.—Region I, Idaho, Montana, Oregon, Washington and Alaska.

San Francisco—Region II, California and Nevada.

Denver—Region III, Arizona, Colorado, New Mexico, North Dakota, South Dakota, Utah and Wyoming.

Bartlesville, Okla.—Region IV, Arkansas, Kansas, Louisiana, Mississippi, Missouri, Oklahoma and Texas.

Pittsburgh — Region V, comprises all the other states.

Under the reorganization, all Bureau of Mines operations in a region, except those dealing with health, safety, coal mine inspection, and helium will be directed from regional headquarters.

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Western States

Expand Utah Plant

Expansion to double the capacity of the phosphoric acid production unit at Western Phosphates, Inc., plant at Garfield, Utah, has been announced by John Paul Jones, vice-president and general manager of the firm. The expansion will put annual pellitized fertilizer production at about 135,000 tons by next spring.

The plant was originally built to allow for expansion when and if warranted. Present production of phosphatic materials is about 90,000 tons a year.

The new plans will call for increased production of phosphate rock which is mined at Leefe, Wyo., by San Francisco Chemical Co. The mining firm also produces rock from other properties in southern Idaho and northern Utah.

Increasing Production

Stardust Mines, Inc., is reported to be expanding production daily from two quartzite quarries in the Snake Mountains just north of Baker, Nev. At present the entire output of these quarries is going to the Las Vegas, Nev., area and to southern California. Principal use of the quartzite is for store fronts and decorative trim. Physical qualities of the material make it ideal for such use, as does its ability to take a high polish.

Park City Discovery

United Park City Mines Co., has reported making an important high-grade lead-silver discovery along the Crescent Fissure on the 2100-ft level in the Daly-West section of its Park District, Utah, property.

The discovery was made a few weeks ago and drifting has been continuing ever since. It is considered too early to estimate reserves, but the company regards the potential of the find as most promising. The discovery is on the same level as the Ontario Drain tunnel. The company is now producing about 250 tpd of ore from the Ontario section of the mines.

Some 160 miners are now employed on a two-shift basis at the properties—representing a merger of the holdings of the old Silver King Coalition Mines Co. and Park Utah Consolidated Mines Co. More employment looms in the future for the recently reopened mines. Development work was begun on a number of levels near the stoping area of the Ontario mine shortly after the mines were reopened in October.

Construct Lithium Plant

Plans have been completed for the construction by American Potash & Chemical Corp. of a plant for the manufacture of lithium chemicals near San Antonio, Tex., Peter Colefax, president of the company, has announced.

This facility will be owned by a newly-formed company, American Lithium Chemicals, Inc., 50.1 percent of whose stock is held by American Potash & Chemical Corp. and the balance by Bikita Minerals (Private) Ltd. Lithium ores for the plant will be supplied by the latter company from its large deposit of high-grade lithium ores in Southern Rhodesia, Africa. Selection Trust Limited of London is responsible for the technical management of Bikita Minerals.

Ability to use Southern Rhodesia ores in the United States is dependent upon securing economic transport rates, the high quality of the Bikita deposit, and advances in processing as the result of intensive research, Colefax explained.

Shift Operations

According to a recent report, Highland-Surprise Consolidated Mining Co. is shifting its main operations from the Pine Creek District of Idaho to the Stanley area in Custer County, north of Sun Valley, Idaho. Officials have disclosed that the company has taken the property in the Stanley area under lease and purchase option. It has also staked some adjoining ground and a mill site.

The Pine Creek properties of the company are being abandoned and the rails and other equipment removed from the lower mine levels. Extraction of small deposits of ore remaining above the 1000-ft level probably will be left to lessees, it was said.

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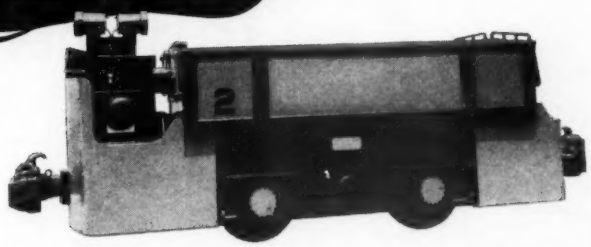

The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

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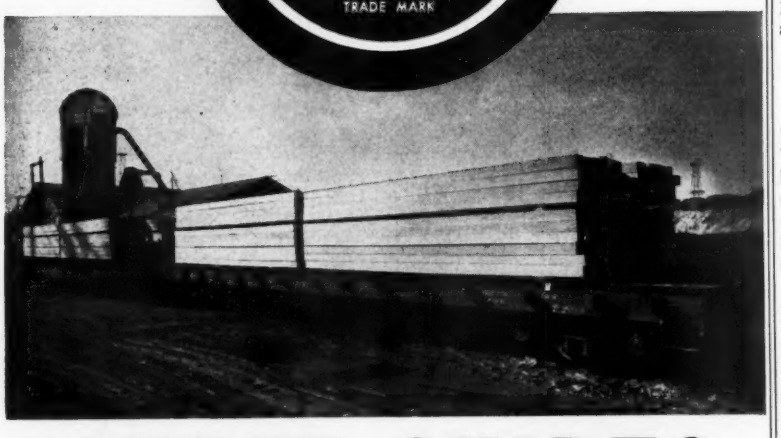

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Polaris Miners Vote No Union

A second effort in two and a half years to organize employes of the Polaris Mine at Wallace, Idaho, ended in failure again in late November. The men voted 66 to 48 in favor of no-union in an election supervised by the National Labor Relations Board. The union making the organization attempt was the CIO Steelworkers Union.

A previous attempt to organize the Polaris mine was made in February 1952, when employes voted 76 to 25 against the Mine-Mill union.

Titanium in Wyoming

Subject to further ruling by the U. S. Department of Agriculture, the Wyoming Game and Fish Commission has stated it has no objection to restoring a portion of the land previously withdrawn to constitute the Sheep Mountain Game Refuge. The area in question contains titanium.

The commission, after meeting with representatives of the U. S. Titanium Corp. on December 3, said it has no objection to restoration of the land if the Federal department finds they are more valuable to Wyoming for mining.

Mobile Drilling

(Continued from page 21)

in turn resulted in smaller inventories of bits, drill rods, oil barrels and other equipment and minimized the loss of material.

(b) Better breakage of banks resulting in decreasing the amount of expensive bank holes from five percent of total to less than one percent. The remaining bank holes are now drilled by the mobile drill operating from the top of muck pile.

(c) Faster penetration of the ground with less gauge wear of the bit has resulted in larger and straighter drill holes—a distinct aid to the springing and loading crews.

(d) Providing better grades results in easier work for the springing and loading crew.

In conclusion, the mobile drill at the Utah Copper pit has resulted not only in a faster, cheaper method or drilling holes, but has brought many other improvements to the operation. The entire mobile drill story is but an example of what must be done by industry in its never ending search for new and better methods and machines to combat the ever rising costs of labor and supplies.

Tooele Concentrator Operates

International Smelting and Refining Co. has started up its Tooele, Utah, lead-zinc concentrator. The opening is based upon resumption of continuous mining operations of the United Park City Mines Co. property, and stockpiling of ore from that property at the concentrator. The concentrator had been closed since early in 1954.

Custom Mill in Montana

Contract Milling Co., has completed its custom mill built on the Margaret Ann claim of the Mitchell Mining Co. at Walkerville, Mont. According to reports the mill is treating about 75 tpd of gold-silver-lead ore from the Margaret Ann. It is also accepting limited amounts of custom ore. Among those recently received is a shipment of tungsten ore from the Storm Lake mine of the Sunshine Mining Co. of Kellogg, Idaho.

Maybe Mine

S. G. McFarland and S. R. Hullinger, Tooele mine operators, are commencing production on a new multi-million dollar orebody at the Maybe mine, 18 miles north of White Canyon, Utah.

The Maybe mine tunnel has been driven a distance of 1800 ft to intersect the main ore body. Six experienced miners from the Tooele district completed the tunnel in less than four months. Modern tramming equipment and excellent mine techniques have been utilized, but the cost of driving the tunnel, plus organization of the mine camp in Red Canyon is said to have exceeded $100,000.

Actually the tunnel was over a portion of the ore body for more than 200 ft before intersecting what was thought to be the outer edge of the deposit in the Shinarump formation. As a result, McFarland and Hullinger are moving back from the face of the ore to start a small inclined shaft. Ore from the mine is now being stockpiled near the adit.

The Tooele mine contractors are operating on a lease from E. J. Hall and Kenneth Bailey, Jr., Monticello equipment suppliers.

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1955 Mining Convention—Metals and Industrial Minerals

Las Vegas, October 10-12

MINING men and ladies all over the country are looking forward to the time next fall when they will gather at Las Vegas, Nev., for the Metal Mining and Industrial Minerals Convention of the American Mining Congress.

This will be the first time in many years that the meeting has been held in the Silver State, hence it is fitting that Roy A. Hardy of Reno was elected as Chairman of the Western Division of the American Mining Congress. Under his direction plans are already under way to see that this meeting is a success not only from the standpoint of the quality and scope of the discussions and operating papers presented but also as a demonstration of true Nevada hospitality.

Roy A. Hardy

In the clear air of southern Nevada, mining men will have an opportunity to hear about and to discuss the many problems with which the industry is confronted. Leading legislators and Government officials will exchange views with prominent mining men on matters that affect the industry on the national level. In the operating sessions, the latest experience with new equipment and methods will be reviewed by the men responsible for making them work. The whole program will reflect the atmosphere under which mining men are living and working in the year 1955. Trips to Hoover Dam and to outstanding mining and metallurgical operations in the vicinity will round out the schedule.

This first Mining Congress meeting ever to be held in the fabulous city of Las Vegas will undoubtedly attract a heavy attendance. Each of the famous hotels in this well-known "fun spot" has promised a full quota of rooms for the Convention visitors, but it will be advisable to return application blanks requesting reservations promptly when they are received. These will be mailed to the industry in February and should be returned as soon as possible to the Las Vegas Housing Committee, Las Vegas Resort Hotels Association, P. O. Box 1750, Las Vegas, Nev.

Celebration at Ajo

The one hundredth anniversary of the opening of the first copper mine by white men at Ajo, Ariz., was recently celebrated there with a pageant, "The Copper Giant." More than 200 persons took part. The first mine was opened in 1854.

Testing Shale in South Dakota

The South Dakota School of Mines recently reported to the State Natural Resources Commission on progress made in determining the bloating characteristics of South Dakota shale used in lightweight aggregate manufacture. Deposits near Aberdeen, Sisseton, Mobridge, Chamberlain, Fort Pierre and the Black Hills have been tested up to this time. Other shales in eastern South Dakota are to be tested later.

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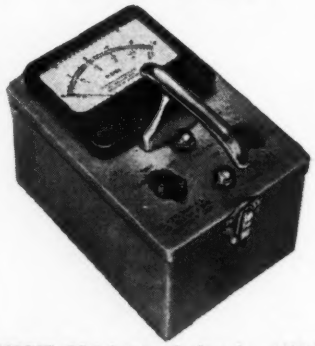

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Annual Business Meeting

(Continued from page 53)

Coal Co., and Guy V. Woody, Allis-Chalmers Manufacturing Co.

Hon. Dewey Short (Rep., Mo.), chairman of the House Armed Services Committee, was the guest speaker. In an inspiring address Rep. Short emphasized the fact that the safety of the Nation comes before self-interest. With this in mind he said that we should all work together as a team.

Short pointed out that to insure the Nation's safety, we must maintain our military might despite the cost. He predicted that defense spending will be reduced to approximately $35 billion and will likely level off at that figure. The administration, he said, has reduced defense expenditures from $52 billion to this new low and has built a strong and effective defense machine.

In speaking particularly of the mining industry, Short pointed out that regardless of which party is in power, the small or marginal miner has a tough road ahead. He said that he has always been in favor of higher tariffs, but faced the fact that we can look for a continuation of the trend to lower tariffs.

"Relief for mining, if any," he said, "must come from the Congress and then only if the mining industry can get together and decide on measures agreeable to all. If the industry can cooperate and present a solid front, then it may get some relief."

Continuing, he said: "Mining is recognized as the most vital segment of our productive capacity for defense. The military needs iron and steel, coal, oil, and many other minerals. We must maintain and even increase our ability to produce them. From a defense standpoint, too much capacity, too soon is far better than too little, too late."

President Young assured Short that mining would carry on—with his help and that of other statesmen in Washington.

Following the membership meeting, the AMC Board of Directors elected Howard I. Young president for another term; Worthen Bradley, Andrew Fletcher and Raymond Salvati were re-elected vice-presidents and Julian D. Conover, executive vice-president and secretary.

Open New Orebody

Clayton Silver Mines has opened the South ore body on the new 500 level at its property in the Bayhorse district of Custer County, Idaho.

Prior to this, all production had come from the North ore body above the 400 level, except for the small amount of development ore from the new level.

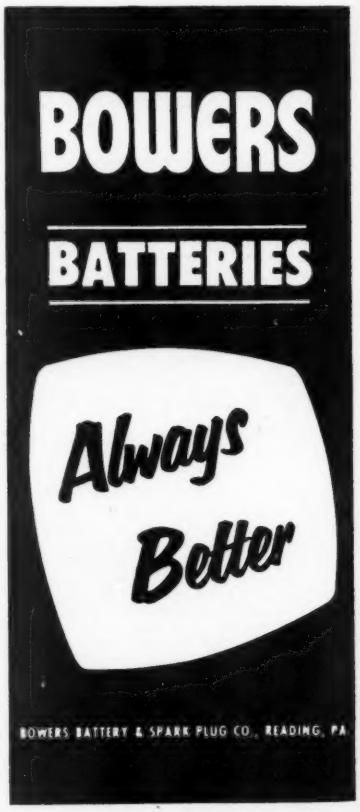
Wheels of Government

(Continued from page 56)

clared that air and water pollution are among the leading health problems that need Federal-State-local cooperative solutions. She told the conference that the President was deeply concerned about water and air pollution problems, and emphasized that there is "great need for expanded activity" in this field, particularly in the way of research and field investigation.

Surgeon General Leonard A. Scheele of the Public Health Service echoed these sentiments and called for intensified research by industry, communities, States, and Federal agencies. He disclosed that the President has appointed a new Inter-Agency Committee on Water Resources to study the critical need for waste treatment works. Members of the Committee are high-ranking officials of the Interior, Agriculture, Commerce, Army, and Health, Education and Welfare Departments and the Federal Power Commission.

It will be recalled that in several past sessions of Congress moves have been made to secure enactment of legislation to provide for rapid tax amortization of pollution abatement facilities, and the Government's concern over pollution problems may result in definite action along this line.



Manufacturers Forum

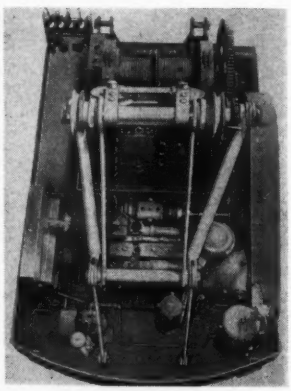
Explosion-Proof Motor

Explosion-proof Tri-Clad "55" motors, featuring extra protection for hazardous-location applications, have been announced by the Small Integral Motor Department of the General Electric Co. Available in ratings from one to five hp, the new addition to G. E.'s line of NEMA rerated motors is especially designed for safe applications in classified atmospheres containing flammable gases or combustible dusts.

Up to the present time, G. E.'s standard explosion-proof motors in these ratings have had Underwriters' Laboratories approval for use in atmospheres containing gasoline, petroleum, naptha, alcohols, acetone, solvent vapors, natural gases, coal dust, coke dust, and grain dust. In addition to these, the new Tri-Clad "55" explosion-proof motors can be used in atmospheres containing metal dusts, magnesium, and aluminum.

Can Convert This Machine

The new Marion 83-M, an all-purpose excavating machine with special features designed to make it a 60-ton special lifting crane, is announced by



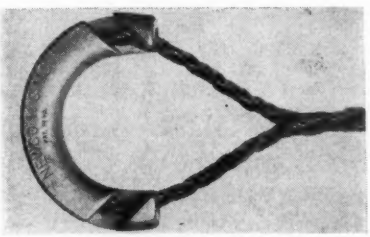
the Marion Power Shovel Co., Marion, Ohio.

As a two-yard shovel, the 83-M was designed for use in construction, quarrying, and mining. But the machine can also be converted in the field to a dragline, clamshell, pull shovel, or crane.

One of the outstanding new features of the 83-M, the company reports, is new self-cooling swing clutches. They are designed to reduce heat damage to the expanding rubber tube of the clutch by isolating the tube from the friction surfaces by means of aluminum friction shoe carriers. Heat from the friction surfaces is carried to cooling fins on the friction shoe carriers and dissipated through large holes in the friction housing.

Slip-On Thimble

A Slip-On Thimble has been made available to the mining industry by the Newman Mfg. and Sales Co.,



P. O. Box 5939, Kansas City 11, Mo. The thimbles are cast of manganese alloy and are said to be particularly well suited to prevent abrasion when a choker sling is used. Flattening or pulling together of the eyes under heavy load is eliminated. The thimbles are reusable.

Fork Lift Truck Spreader

A new industrial spreader operated by any fork lift truck has just been introduced by Swenson Spreader & Mfg. Co. This new spreader handles salt, cinders, sawdust, sand, crushed stone and similar materials. It is for use in the winter time to spread these safety materials over ice-covered walks, parking lots, loading areas and drives in outdoor areas. Year-around use includes top dressing of black topped floors and aisles, spreading of oil-absorbent or moisture-absorbent materials and similar tasks around the plant.

Complete information may be obtained from Swenson Spreader & Mfg. Co., Lindenwood, Ill.

Diamond Drill Core Barrel

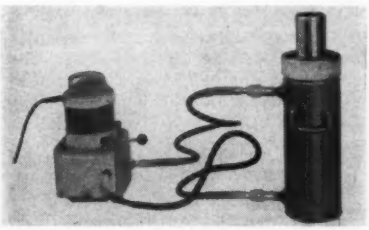
Hoffman Bros. Drilling Co., Punxsatawney, Pa. has developed the Beaver Core Barrel to meet the demand for a core barrel to be used with the newer, more powerful, air drilling rigs. According to the manufacturer this is the only barrel of its kind for coring coal and will serve equally well in many formations typical to the metal mining industry.

Precision machined parts are said to assure better cores and increase bit life. The Beaver barrel has an exceptionally heavy outer shell to help reduce maintenance and promote easy core removal on tough drilling jobs with big rigs. Detailed information and prices on request.

Power Jack

A 60-ton hydraulic jack and puller with a separate motor-powered pumping unit has been announced by Templeton, Kenly & Co. Designed for heavy duty jobs, the jack's hydraulic ram can be both raised and lowered by power. The jack has a 10-in. travel.

Connected to the pumping unit by



flexible hydraulic hose, the ram can be remotely located for greater operator safety and easier use in cramped quarters. The pump, which is powered by a ½-hp universal motor, may be operated by 115 v. a-c or d-c. It can be started or stopped without losing travel of the ram.

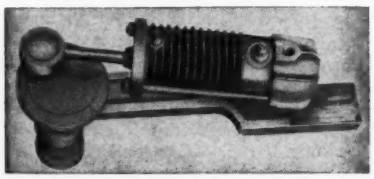
The 60-ton ram is also available with a remote hydraulic hand pump instead of the motorized unit.

Both the motorized and hand pump models are described in Form R-6010. For a free copy, write Templeton, Kenly & Co., 2525 Gardner Road, Broadview, Ill.

Tractor-Mounted Compressor

The Worthington Mower Co. of Stroudsburg, Pa., has just introduced a portable air compressor for attachment to the rear power-take-off of all makes of tractors.

Known as the Worthington-Mobilco Air Compressor, the unit offers a compressed air supply for on-the-job operations around the mine. It can be used to power-grease tractors and other equipment in the field, pump gasoline, spray paint, maintain correct tire pressure at all times, as well as handle many other jobs. It is said



the unit can be attached to a tractor power-take-off in a matter of minutes.

The compressor has a capacity of two cfm at 400 rpm, with pressures up to 120 psi. A built-in relief valve opens when line pressure at the accessory is closed protecting the unit. By means of a change-over piston and cylinder kit, the compressor can be converted into a pump.

Dust Collection

Van-Truer Co., Inc., recently announced the development of a wet-type dust and fume collector. It consists of a cylindrical drum with a series of cones and baffles.

Water, supplied by a direct driven pump, cascades downward within the collector. This action produces a series of closely related water curtains through which the dust-laden air is filtered in its upward travel.

Descriptive literature and complete technical details on Van-Truer dust collectors can be obtained by writing the company at 12600 Beech Road, Detroit 23, Mich.

Recording Scintillation Counter

The production of a sensitive recording scintillation counter has been announced by Sherwin Instrument Co., Inc., 2875 Broadway, New York City. Designated as Model SC-10, the counter was designed primarily for airborne or ground geological surveys in searching for uranium and oil.

The SC-10 is composed of a detector head which contains an eight-in. "Plastifluor" crystal and a five-in. photomultiplier tube, a ratemeter which features full-scale count rates of 1000, 2000, 20,000 and 40,000 counts per second and time constants of 0.1, 1.0 and 10.0 seconds; an external meter with extension cable for remote indication. The units are shock-mounted and tropicalized.

Replace Mechanical Snubbers

A new automatic stop control designed to replace mechanical snubbing on vibrating equipment with smooth electrical braking action has been announced by Allis-Chalmers Mfg. Co.

The new stop control consists of a magnetic reversing switch, thermal relay units and pneumatic timers—a coast timer and a plugging timer.

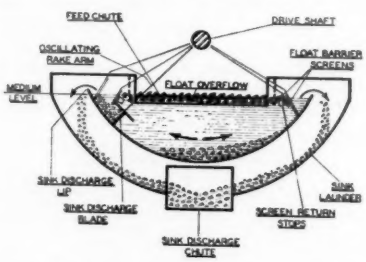
A description of the new stop control and its operation is carried in leaflet 07B8141, copies of which are available from Allis-Chalmers Manufacturing Co., 972 S. 70th Street, Milwaukee, Wis.

Hydraulic Hose and Couplings

Joy Mfg. Co., Oliver Bldg., Pittsburgh, Pa., has announced the introduction of a new line of hydraulic hose and couplings, tradenamed Surgepruf, for medium-high and high pressure service. The couplings, manufactured to J.I.C. standards, feature a "double-wedge" grip which, the manufacturer claims, makes possible assembly on rubber covered hose without skiving. Through use of a special slotted bushing the manufacturer reports it has made possible retightening the Surgepruf coupling on the hose without disassembly when and if it comes loose through vibration or flexing.

Enter HMS Field

The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., recently announced its entry into the Heavy Medium Separation field with a new separatory vessel. According to the announcement the problem of removing sink material simply and efficiently has been solved in the design of the



OCC Vessel. The manufacturer also claims ease of installation, operation and maintenance, with low power requirements.

Three-product separation can be accomplished by operating two vessels in tandem. Six basic designs have been worked out to take care of all separating problems and capacities up to 400 tph.

For full information write the Mining & Milling Machinery Division of OCC.

Develop Aluminum Welding Electrode

To provide maximum weld quality in the inert-gas, shielded arc welding of aluminum, Aluminum Co. of America has developed a new high quality welding electrode.

The new Alcoa electrode was designed to be used in the welding guns employed with existing consumable electrode, shielded arc processes.

Alcoa I. G. Welding Electrode can also be used for tungsten-arc welding where the filler wire is fed mechanically to the work.

Further information on Alcoa I. G. Welding Electrode can be obtained by writing to Aluminum Co. of America, 738 Alcoa Building, Pittsburgh 19, Pa.

D-C Motor Development

A new line of industrial d-c motors has been introduced by the Reliance Electric and Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio.

These new motors, called the Super "T" Line, are described by the manu-

facturer as producing fast and accurate response.

They accelerate to full speed in half the time formerly required through incorporation of lower mechanical inertia, lower electrical inertia and higher commutating ability in their design.

Motors are being produced in sizes from 20 to 100 hp, and the range will be extended to both higher and lower horsepowers.

Six-Wheel Off-Highway Truck

A new, extra-heavy-duty, six-wheel truck model, the International RF-230, specially designed for off-highway service, has been placed in production by the motor truck division of International Harvester Co.

The new model, with gross vehicle weight rating of 60,000 lb, is powered by the new 201-hp International RD-501 engine, which delivers 430-lb-ft torque at 1600 rpm.

Equipment includes hydraulic, full-power steering; air brakes; 15,000-lb front axle; 46,000-lb rear bogie; 12-v electrical system; 60 gal, right-side, step-type fuel tank; and 15-in. clutch. Standard wheelbase is 175 in.; optional wheelbases are available.

— *Announcements* —

Hamilton M. Ross has been appointed manager of operations of the Conveyors Division of **Hewitt-Robins Incorporated** and **Harold E. Murken** has been appointed manager of conveyor system sales.

Chester C. Boesewetter has been appointed chief engineer of **Penn-Union Electric Corp.**, manufacturer of a complete line of conductor fittings. Before joining Penn-Union, he was with Goodman Mfg. Co.

The appointment of **R. M. Miller** as vice-president was recently announced by **Stearns Magnetic, Inc.**, Milwaukee, Wis., manufacturers of magnetic separation and power transmission equipment. He will be responsible for the sales, production and engineering activities of the entire company.

A. G. Lindquist, secretary and comptroller of **Gardner-Denver Co.**, has been elected vice-president of the company.

Lindquist, who has been associated with Gardner-Denver for the last 16 years, will continue as secretary and comptroller in addition to his new duties.

At a recent stockholders and directors meeting, **C. O. Crump** was elected to the board of directors and made president of **Sanford-Day Iron Works, Inc.** Crump succeeds **P. S. McCallen**, who retired in April.

Other officers elected were **R. E. Jones**, vice-president in charge of engineering, and **W. D. Moreman**, vice-president in charge of sales.

On December 1, 1954, the **Alden Equipment Co.** moved to new and larger quarters at 1449 West Rosecrans Ave., Gardena, Calif. This company represents Mechanical Handling Systems, Inc., Louden Machinery Co., Jeffrey Mfg. Co., Cleveland Worm & Gear Co. and Farval Corp.

A new **General Motors Training Center**, opened at San Leandro, Calif., offers service training courses on all **Euclid** earth moving equipment. Information and applications for enrollment may be obtained from Euclid dealers or from the Service Training Department, Euclid Division of General Motors Corp., Cleveland 17, Ohio.

Effective date of the merger of **The Dorr Co.** of Stamford, Conn. and **Oliver United Filters** of Oakland, Calif. under the name of Dorr-Oliver Inc. is January 1. At that time the following personnel changes in the areas of Sales Promotion and of Public Relations went into effect.

C. W. Crumb, sales promotion manager for Oliver United Filters took over the same responsibilities for the joint corporation. **C. M. Comstock**, assistant advertising manager of Dorr became assistant sales promotion manager for Dorr-Oliver.

The appointment of **Charles J. Haring**, as director of Equipment Sales for **Westinghouse Air Brake Co.** was recently announced.

Trombetta Solenoid Corp., of Milwaukee, Wis., announces the opening of its first district office, located in the Cincinnati area at 612 Garfield Ave., Milford, Ohio. Under the direction of Howard Odoms, the branch will operate in the state of Ohio and a 125-mile radius of Cincinnati.

CATALOGS AND BULLETINS

ALLOY STEEL. *Jones and Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.* This is a leaflet on "Jalloy-Grade 3," a special alloy steel for heavy duty use. Outlined in the leaflet are properties, composition, applications, case histories and information on heat treatment of this steel for optimum results.

CHURN DRILL TOOLS FOR BLAST HOLES. *Spang & Co., Butler, Pa.* The eight-page brochure describes complete line of churn drill tools. Included also are tool specifications and helpful hints for maintaining cable tool bits.

COAL CRUSHERS. *American Pulverizer Co., 1019 Macklin Ave., St. Louis 10, Mo.* The American WC and WS Series Rolling Ring Coal Crushers are fully described. Information includes capacity, horsepowers, speeds and dimensions for both series, also a survey of crusher performance in the field.

COAL HANDLING. *Caterpillar Tractor Co., Peoria, Ill.* Form No. D473, an eight-page booklet, shows new tips for large coal users such as power plants, steel mills and coal docks. It explains the use of Caterpillar's various wheel and track-type machines for stockpiling, sorting and transporting coal.

CONVEYOR BELT REPAIRS. *B. F. Goodrich Co., Akron, Ohio.* A 32-page manual tells how to splice and repair conveyor belting. Step by step illustrations are used. A description of splicing materials and tools needed and the best conditions for splicing and repair, methods of splicing cord and fabric belting and special procedure in splicing rayon belts are included.

CRAWLER TRACTORS. *Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis.* Titled "Facts—On a New Breed of Tractors," this 16-page brochure presents operational methods and specific features of the four new crawlers in the A-C line. Specifications of each of the four tractors in the line are listed.

DEEP HOLE PERCUSSION DRILLING. *Gardner-Denver Co., Quincy, Ill.* This booklet contains information on deep hole drilling with percussion rock drills. In a convenient form for mine and quarry operators and contractors engaged in rock excavation it gives job reports, contains application suggestions and a description of Gardner-Denver's complete line of deep hole percussion drilling equipment.

HYDRAULIC JUMBOS. *Gardner-Denver Co., Quincy, Ill.* Bulletin J-100 describes a complete line of Gardner-Denver equipment for hydraulic drill jumbos and power feed rock drills. Also described are hydraulic drill jumbos for rail service, a self-propelled jumbo with remote controls, roof-pinning jumbos and tractor-mounted jumbo units, complete with air compressor.

LABORATORY HEAVY MEDIA EQUIPMENT. *Western Machinery Co., 760 Folsom Street, San Francisco 7, Calif.* Bulletin No. L-1-I-1 describes laboratory equipment for batch or continuous HMS processing of ores, coals and aggregates. Application information and product characteristics, as well as specification drawings and data covering several pieces of equipment, are included in the illustrated bulletin.

LIFT SLAB CONSTRUCTION. *United States Lift Slab Corp., Perry-Brooks Building, Austin, Tex.*, has published a 32-page, illustrated booklet which gives details about a relatively new method of building construction. Seven chapters deal with such topics as the basis for evaluating the method, engineering, construction procedure, comparative costs and advantages of Lift Slab Construction. Copies may be obtained by writing the corporation at the above address.

NEW DYNAMOTOR DATA. *Gothard Mfg. Co., 2110 Clear Lake Ave., Springfield, Ill.* A condensed catalog has been published on the Gothard Line of commercial, military and mobile dynamotors. Bulletin No. 410 contains much valuable information on a-c to d-c power conversion as provided by the various Gothard units. A copy may be had without charge by writing to Howard B. Elder, sales manager, at the above address.

POWER-TRANSMISSION EQUIPMENT. *The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.* The bulletin covers American's complete line of Power-Transmission Equipment. There are brief descriptions of American's Wedgbelt drives, Shaft-King speed-reduction drives, adjustable-speed sheaves, steel split pulleys, conveyor pulleys, motor bases, Hi-Torque pulleys, collars and shaft hangers.

ROTARY CONVERTERS. *Gothard Mfg. Co., 2110 Clear Lake Ave., Springfield, Ill.* Bulletin 420 describes the Gothard line of heavy-duty, industrial-type, 3600 rpm converters. Characteristics and capacities of the converters are described. For a copy of Bulletin 420, write Howard B. Elder, sales engineer for the company.

RUBBER-LINED PUMPS. *Allis-Chalmers Mfg. Co., General Machinery Division, 972 South 70th St., Milwaukee 1, Wis.* Bulletin 52B8156, "Allis-Chalmers rubber-lined NRL pumps," describes pumps designed for handling abrasive, fine-mesh material, sand, taconite, grinding mill discharge, tailings, silicon carbide, aluminum oxide, slimes and slurries. They are available in open or closed impeller models at capacities from 10 to 3000 gpm at heads through 140 ft.

STORAGE BATTERY LOCOMOTIVES. *Goodman Mfg. Co., Halsted St. & 48th Pl., Chicago 9, Ill.* Catalog No. M-549 describes the complete line of Mancha storage battery locomotives with Track Master design. Both locomotive and battery specifications are included.

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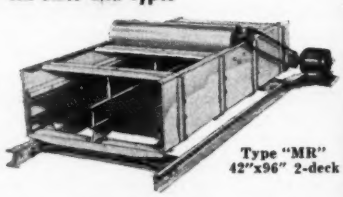

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To meet the requirements of our own contract drilling crews, we are obliged to supply a wide variety of accessory equipment and to carry all commonly-used items in stock for immediate delivery. The same prompt service is available to other diamond drill operators and ordering is made easy by a 28-page catalog which gives all necessary information—including illustrations, piece numbers, weights and code numbers, for ordering by wire or cable. Every operator of a diamond drilling rig should have a copy of Bulletin 31-F and we'll send one free of charge.

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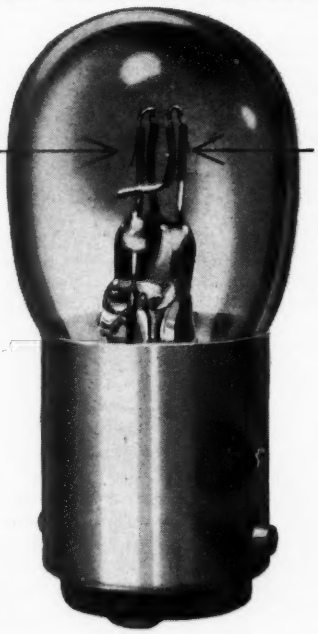

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